2022 Post-construction Monitoring Study for the Bitter Ridge Wind Farm Jay County, Indiana

Draft Report
April 1 – October 15, 2022

Prepared for:

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EXECUTIVE SUMMARY

Bitter Ridge Wind Farm, LLC (Bitter Ridge), is operating the Bitter Ridge Wind Farm (Project) in Jay County, Indiana. Bitter Ridge obtained an Incidental Take Permit (ITP; ESPER0014119) for the federally listed Indiana bat and the federally listed northern long-eared bat (hereafter, Covered Species) from the US Fish and Wildlife Service (USFWS) dated June 15, 2021. This report details the post-construction monitoring studies conducted in 2022, consistent with the Project's Habitat Conservation Plan (HCP) and ITP for Covered Species, and the study plan developed for ITP monitoring in 2022.

Post-construction monitoring was completed in accordance with the 2022 study plan. The initial draft of the study plan was submitted to the USFWS on March 18, 2022 and received final approval on April 5, 2022. The study plan was designed to achieve a probability of detection, or *g*, of 0.25. The overall goal of this post-construction monitoring study was to generate reliable fatality estimates for the Covered Species and to evaluate compliance with the incidental take authorization granted under the Project's ITP. Specifically, the objectives of the study were to estimate Covered Species take using the Evidence of Absence (EoA) framework as outlined in the HCP, and determine overall bat fatality rates. This report presents the results of the study conducted within the Project from April 1 – October 15, 2022.

Standardized carcass searches were completed for bats at three plot types: cleared plots, uncleared plots, and road and pad plots. Technicians searched gravel road and pad plots at all 52 turbines out to a distance of 100 meters (m; 328 feet [ft]) from the turbine during the spring study period (April 1 – May 15). During the summer study period (May 16 – July 31), 37 summer risk turbines were searched weekly. A dog-handler team searched cleared plots at eight turbines and uncleared plots at eight turbines during the summer, while a technician searched 21 road and pad plots. During the fall study period (August 1 – October 15), all 52 turbines were searched twice per week with a technician searching road and pad plots at 36 turbines and dog-handler teams searching cleared plots at eight turbines and uncleared plots at eight turbines. In both summer and fall, cleared and uncleared plots were searched out to a radius of 70 m (230-ft). Searcher efficiency and carcass persistence trials were also conducted during each season to correct for carcass detection and scavenger removal bias.

The most commonly found bat species were eastern red bat (35.9%), silver-haired bat (26.7%), big brown bat (22.6%), and hoary bat (12.2%). Four carcasses of the state endangered evening bat were recorded at the Project. Species composition recorded at the Project was similar to the first year of ITP monitoring conducted in 2021. The overall probability of detection (*g*) distribution for 2022 post-construction monitoring surveys had a mean of 0.28 (95% Confidence Interval [CI]: 0.26–0.29). During the study, 532 bat fatalities were found. The overall bat fatality rate was 15.84 bats per megawatt (90% CI: 12.08–21.59).

Three Indiana bat carcasses were found during post-construction monitoring surveys: one on August 30, 2022, at Turbine 17, and two on October 7, 2022, at turbines 36 and 39. No northern

long-eared bat carcasses were found. Based on the second year of ITP monitoring, cumulative take to-date, *M** at α = 0.5 (50th credible bound), is estimated to be 17 Indiana bats and zero northern long-eared bats. Estimated take for the Covered Species falls below the permitted take level for both species, meaning the Project was in compliance with the ITP. The EoA model estimated the mean annual take rate (λ) at the Project was 10.41 Indiana bats and 0.95 northern long-eared bats. The probability that the annual take rate exceeded the expected annual take rate for Indiana bat (10.41) was greater than 95%, exceeding the short-term adaptive management trigger and indicating that the Applicant should consider adaptive management actions in accordance with HCP section 5.4.3.

STUDY PARTICIPANTS

Kevin Murray	Project Manager, Permitted Bat Biologist
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INTRODUCTION

Bitter Ridge Wind Farm, LLC (Bitter Ridge), is operating the Bitter Ridge Wind Farm (Project) in Jay County, Indiana. Bitter Ridge obtained an Incidental Take Permit (ITP; ESPER0014119) for the federally listed Indiana bat (*Myotis sodalis*) and the federally listed northern long-eared bat (*M. septentrionalis*; hereafter Covered Species) from the US Fish and Wildlife Service (USFWS) dated June 15, 2021. The ITP requires the Project to minimize impacts to Covered Species. The ITP requires monitoring to determine if the level of impact exceeds authorized amounts of take, and to determine if adaptive management is necessary to further reduce impacts.

Western EcoSystems Technology, Inc. (WEST) completed a post-construction monitoring study designed to achieve a probability of detection, or *g*, of 0.25. The objectives of this study were to estimate Covered Species take using the Evidence of Absence (EoA) framework as outlined in the Habitat Conservation Plan (HCP), and determine overall bat fatality rates for the study. This report presents the results of the study conducted within the Project from April 1 – October 15, 2022; the Covered Species take assessment in this report also incorporates the results of the June 21 – October 15, 2021 study (Murray et al. 2022). Bird fatalities were recorded, but were not the focus of this particular ITP study and no analysis of avian fatality rates are included in this report.

STUDY AREA

The Project is located in Jay County, Indiana, on 8,972 hectares (22,170 acres) of private land approximately nine kilometers (six miles) southwest of Portland, Indiana (Permit Area; Figure 1). Prominent geographic features within the Project include the Platt Nibarger Ditch and the Beason Ditch, both of which flow south to join the Mississinewa River, which roughly parallels the southern boundary of the Project. According to the National Land Cover Database (2019), the primary land cover type within the Project is cultivated crops, which covers 82.1% of the Permit Area, followed by deciduous forest, which makes up 8.0%, developed open space, which makes up 4.8%, and hay/pasture, which makes up 3.6% of land cover. The remaining land cover types compose less than 1.7% of total land cover (Table 1).

Bitter Ridge became fully operational in September 2020, and consists of 52 General Electric 2.82-megawatt (MW)-127 turbines with a nameplate capacity of 2.82 MW each. All turbines are within the migratory range of the Covered Species. During the 2022 spring migration period (April 1 – May 15) and fall migration period (August 1 – October 15) all turbines were feathered from half an hour before sunset to half an hour after sunrise when wind speeds were below 5.0 meters per second (m/s; 16.4 feet per second [ft/s]) and temperatures were above 10 degrees Celsius (°C; 50° Fahrenheit). The HCP identified 37 turbines within 305 m (1,000 ft) of summer maternity colony habitat for Indiana bat. Bitter Ridge feathered blades at those turbines from half an hour before sunset to half an hour after sunrise when wind speeds were below 5.0 m/s and temperatures were above 10°C. This was done during the summer maternity season (May 16 – July 31) to minimize impacts to summer maternity colonies. The remaining 15 turbines were feathered below the cut-in speed of 3.0 m/s (9.8 ft/s) during the summer.
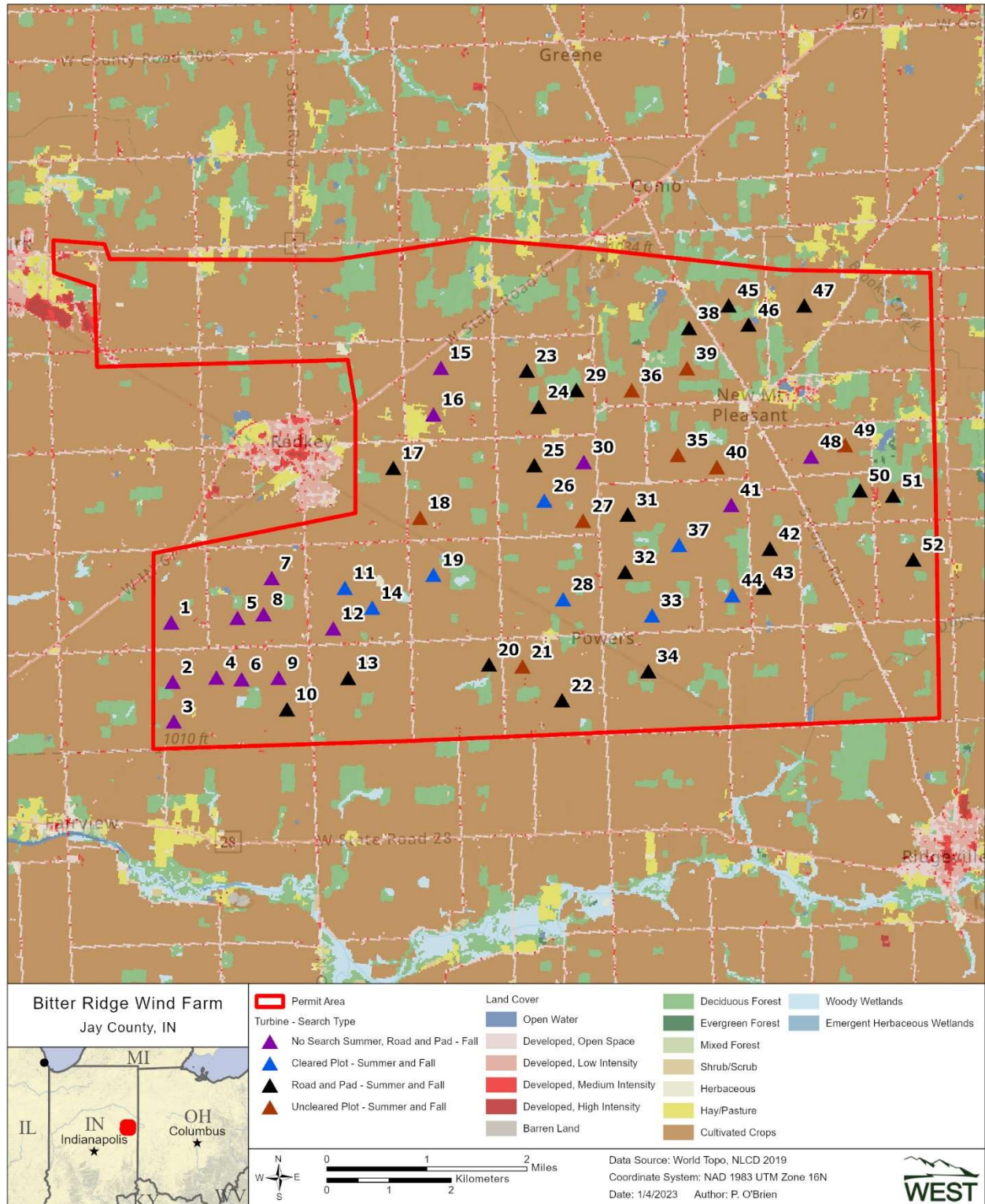
Figure 1. Turbine locations by summer and fall search type and surrounding land cover at the Bitter Ridge Wind Farm, Jay County, Indiana. Road and pad plots were searched for all turbines in spring.

Table 1. **National Land Cover Database land cover types and percent (%) composition within the Bitter Ridge Wind Farm Permit Area, Jay County, Indiana.**

Habitat	Hectares	Acres	% Composition
Cultivated Crops	7,365.4	18,200.3	82.1
Deciduous Forest	718.5	1,775.4	8.0
Developed, Open Space	435.0	1,074.9	4.8
Hay/Pasture	327.3	808.7	3.6
Herbaceous	52.0	127.5	0.6
Developed, Low Intensity	31.0	76.5	0.3
Open Water	20.0	49.0	0.2
Shrub/Scrub	7.4	18.4	0.1
Woody Wetlands	5.2	12.8	0.1
Emergent Herbaceous Wetlands	5.1	12.7	0.1
Developed, Medium Intensity	4.5	11.2	0.1
Evergreen Forest	0.6	1.6	<0.1
Developed, High Intensity	<1.0	0.5	<0.1
Total	**8,972.0**	**22,169.5**	**100**

Data from the National Land Cover Database (2019).

METHODS

WEST used data collected during 2021 post-construction monitoring (PCM) at Bitter Ridge (Murray et al. 2022) and public data collected during 2020 PCM at the Headwaters Wind Farm (Rodriguez et al. 2021) to develop a study plan that targeted a *g* of 0.25 to meet the monitoring commitments in the HCP. The study plan was submitted to the USFWS on March 18, 2022, and received final approval on April 5, 2022 (M. Reed, USFWS, pers. comm.).

Standardized Carcass Searches

Number of Turbines Sampled, Search Frequency, and Plot Size

Technicians and dog-handler teams conducted standardized carcass searches from April 1 – October 15, 2022. Search effort varied by season, and was designed to take advantage of available dog-handler teams and to maximize effort when the greatest number of Covered Species were expected to occur (Table 2).

Table 2. **Search effort by season and plot type at Bitter Ridge Wind Farm, Jay County, Indiana.**

Season	Plot Type	Search Interval	Number of Turbines	Search Team
Spring (April 1 – May 15)	100-m road and pad	Weekly	52	Technician
Summer (May 16 – July 31)	100-m road and pad	Weekly	21	Technician
	70-m uncleared plot	Weekly	8	Dog handlers
	70-m cleared plot	Weekly	8	Dog handlers
Fall (August 1 – October 15)	100-m road and pad	Twice weekly	36	Technician
	70-m uncleared plot	Twice weekly	8	Dog handlers
	70-m cleared plot	Twice weekly	8	Dog handlers

m = meter.

All 52 turbines were searched once per week during the spring (Table 2). A technician searched gravel road and pad areas (road and pad plots) under turbines to a distance of 100 m (328 ft) from the turbine.

During the summer study period 37 summer risk turbines were searched once per week. A technician searched road and pad plots under 21 turbines to a distance of 100 m from the turbine. A dog-handler team searched eight turbines as uncleared plots with a 70-m (230-ft) radius and eight turbines as cleared plots with a 70-m radius (Table 2, Figure 1).

All 52 turbines were searched twice per week during the fall (Table 2). A technician searched 36 turbines as road and pad plots to a distance of 100 m from the turbine (Figure 1). Dog-handler teams searched the eight cleared plots and eight uncleared plots originally created in summer twice a week (Table 2, Figure 1).

During the summer and fall study period, vegetation at cleared plots was mowed and maintained by Project staff within 10 to 15 centimeters (four to six inches) in height to enhance detectability of carcasses. Eight cleared plots were disked once in mid-August and again in early September due to mowing limitations. Uncleared plots were vegetated with soybeans (*Glycine max*).

Search Methods

All personnel were trained to follow the Bitter Ridge search protocol, including proper handling and reporting of carcasses. Carcass searches began after first light, and ended prior to dusk.

Human Searchers

The technicians walked transects spaced five m (16 ft) apart at a rate of approximately 45–60 m per minute (m/min; 148–197 ft/min) on all gravel road and pad areas within 100 m of the turbine. The technicians scanned the area for fatalities on both sides of the transects out to approximately 2.5 m (8.2 ft) to ensure full visual coverage of each search area.

Dog-handler Teams

Detection dog teams searched cleared and uncleared plots for bat carcasses. Detection dogs were considered candidates for carcass searches if they met temperament, basic obedience, and requirements towards the ability to detect bat carcasses. Temperament characteristics that are sought after are high-energy dogs, with a high food or toy drive, and eagerness to please their handler. Prior to conducting searches at Bitter Ridge, handlers trained their detection dogs on the scent of bat carcasses derived from search and rescue programs and drug detection (Kay 2012, Helfers 2017). Dogs were initially trained on cotton scent swabs that had been rubbed on or stored in a container with bat carcasses and progressed to bat carcasses at increasing distances over a period of three to four weeks. Once the dog achieved a passing grade of 80% or higher in a scent recognition test, consisting of 10 blind trial lineups using bat carcasses, the dog and handler were evaluated in the field to measure their performance. The detection dog coordinator conducted a 2-day field evaluation of each dog-handler team; after teams achieved a searcher efficiency of 75% or greater for 30 bats during evaluation trials, they were approved to conduct standardized carcass searches. Because the objective of the study was to document bat carcasses, dogs were

not explicitly trained on native bird carcasses; however, all detection dogs alerted on birds in the field, and handlers rewarded bird finds in the field to encourage future alerts to bird carcasses. Detection dogs used at Bitter Ridge included a border collie, a golden retriever, and an Australian shepherd mix.

Prior to each search, handlers determined the survey start points and the number of transects needed to cover the plot after taking into account wind speed and direction, as well as crop row direction and density (when applicable). Handlers oriented dogs to start searches perpendicular to the wind to maximize scent detection. Both wind speed and crop density can affect scent dispersal across the search area. Transect width varied by plot type to maximize detection and ranged from 5–10 m (16–33 ft) in uncleared plots, and 10–15 m (33–49 ft) in cleared plots. The handler placed a marker by the carcass and rewarded the dog with either a food reward or a short play session when a detection dog correctly alerted to a bird or bat carcass.

Data Collection

For each scheduled search, technicians recorded the date, start and end times, technician name, turbine number, type of search and if any fatalities were found. When a fatality was found, technicians placed a flag near it and continued the search. After searching the entire plot, the technician returned to record information for each fatality on a fatality data sheet, including the date and time, species, sex and age (when possible), technician name, turbine number, measured distance from turbine (with range finder), azimuth from turbine, location of carcass as geographic coordinate system coordinates (latitude and longitude), ground cover surrounding carcass, condition of carcass (i.e., intact, scavenged, dismembered, feather spot [for birds only], injured), and estimated time of death (e.g., less than one day, two days). Technicians took digital photographs of each fatality, including any visible injuries, and surrounding habitat. Carcasses found in non-search areas (e.g., outside of a plot boundary) and those recorded as incidental discoveries (found outside of a scheduled search) were documented following the same protocol for those found during standard searches, but were not included in analysis.

The condition of each carcass found was recorded using the following categories:

- Intact—a complete carcass, not badly decomposed, and shows no sign of being fed upon by a predator or scavenger.

- Scavenged—an entire carcass that shows signs of being fed upon by a predator or scavenger, or a portion(s) of a carcass in one location (e.g., wings, skeletal remains, portion of a carcass), or a carcass that has been heavily infested by insects.

- Dismembered—an entire carcass found in multiple pieces distributed more than 1.0 m (3.3 ft) apart from one another due to scavenging or other reasons.

- Injured—a bat or bird found alive.

For bird carcasses, the following category was also used:

- Feather spot—10 or more feathers (excluding down), or two or more primary feathers at one location indicating predation or scavenging of a bird carcass.

Bat carcasses were collected under the Project's ITP (ESPER0014119), WEST's Federal Native Endangered and Threatened Species Recovery Permit (TE234121-9), and WEST's Indiana Special Purpose Salvage Permit (2229). Technicians placed all bat carcasses in a re-sealable plastic bag labeled with the unique carcass identification number, turbine number, and date, for storage in a freezer on site. Leather and latex/nitrile gloves were used to handle all bat carcasses to reduce the risk of transmission of rabies or other diseases. Bird carcasses were recorded, but left in place. Injured bats were not taken to rehabilitation facilities or euthanized but were left in place.

Tissue samples were collected from heavily scavenged or decomposed bat carcasses that could not be positively identified and had potential to be a Covered Species and were submitted to a USFWS-approved laboratory, the Dr. Jane Huffman Wildlife Genetics Institute for identification associated with East Stroudsburg University. Bat carcasses that were heavily scavenged but did not have potential to be a Covered Species (i.e., fur was present on the wing or forearms measured over 41 millimeters [1.6 inches]) were identified to the closest genus or group possible and were not sent off for further identification.

Carcass Identification and Agency Notification

Identification of bird carcasses were verified by biologists with significant field experience in identification of birds and their feathers. A federally permitted bat biologist (TE234121-9) identified all bat carcasses either via photographs or in person. The USFWS and the Indiana Department of Natural Resources (IDNR) were notified within 24 hours of positive identification any species listed as endangered or threatened under the Endangered Species Act, or any state-listed threatened or endangered species. An additional permitted bat biologist (Kevin Murray [TE234121-9]) verified the identifications of sensitive bat species carcasses in hand. Bat carcasses were delivered to the USFWS Indiana Ecological Services Field Office in Bloomington, Indiana, in January 2023.

Bias Trials

Searcher Efficiency Trials

The objective of the searcher efficiency trials was to estimate the probability searchers found a bat carcass. Searcher efficiency trials were conducted in the same areas where carcass searches occurred. Personnel conducting carcass surveys did not know when searcher efficiency trials were being conducted or the location of the trial carcasses. Trial carcasses consisted of eastern red bats (*Lasiurus borealis*), big brown bats (*Eptesicus fuscus*), hoary bats (*Lasiurus cinereus*), and silver-haired bats (*Lasionycteris noctivagans*) that had previously been found on site, or were provided by Indiana State University. A minimum of 20 bat carcasses were placed and confirmed

available per plot type in the spring, summer, and fall. Multiple trials were conducted in each season to measure potential changes in plot conditions on searcher efficiency over time.

Each trial carcass was discreetly marked with a black zip-tie around the upper forelimb for identification as a study carcass after it was found. Carcasses were dropped from waist-height or higher and allowed to land in a random posture. The number and location of trial carcasses found during the subsequent search were recorded, and the number of trial carcasses available for detection during each search was determined immediately after each trial by the person responsible for distributing the carcasses. Searchers had one chance to locate trial carcasses during the first search after carcass placement. The trial administrator walked in a meandering path and dropped trials for detection dogs the night prior to the next search to allow time for the scent to pool and disperse prior to scheduled searches. Following searches, any carcasses that were not detected were checked to confirm availability. One hundred and five trial carcasses were left in place and used for carcass persistence trials (CPT).

Carcass Persistence Trials

The objective of CPT was to estimate the length of time (in days) a carcass would persist, or be available for detection, in the field. Carcasses could be removed by scavenging or rendered undetectable by typical farming activities. A minimum of 15 trial carcasses were placed in each plot type per season to incorporate the effects of varying weather and climatic conditions on carcass persistence. Trials were conducted across all plot types to incorporate the effects of varying weather and scavenger densities. No more than three trial carcasses were placed on a plot to avoid potential over-seeding and attracting scavengers.

Technicians monitored the trial carcasses over a 30-day period according to the following schedule, as closely as possible. Carcasses were checked daily for the first four days, then on days 7, 10, 14, 21, and 30. Trial carcasses were monitored until they were completely removed or the trial period ended. Detection dogs were used on the cleared and uncleared plots to determine when carcasses were removed.

Search Area Mapping

Technicians recorded the boundaries of all cleared plots using a Trimble submeter global positioning satellite unit. Soy plot boundaries were mapped via desktop geographic information system (GIS) based on turbine location and size of plot and road and pad plot boundaries recorded during previous search years were used. Unsearchable areas within plot boundaries were also mapped. The plot boundaries were used to verify if carcasses were found inside the search areas, and to inform the distribution of carcasses around turbines to estimate the number of carcasses that fell inside or outside of search areas.

Quality Assurance and Quality Control

Quality assurance and quality control measures were implemented at all stages of the study, including in the field, during data entry and analysis, and report writing. Following field surveys, technicians were responsible for inspecting data forms for completeness, accuracy, and legibility. Potentially erroneous data were identified using a series of database queries. Irregular codes or

data suspected as questionable were discussed with the technician and/or project manager. Errors, omissions, or problems identified in later stages of analysis were traced back to the raw data forms, and appropriate changes and measures were implemented. A Microsoft® SQL database was developed to store, organize, and retrieve survey data. All data forms and electronic data files were retained for reference.

Statistical Analysis

The EoA (Dalthorp et al. 2017) modeling framework was used to estimate take of Covered Species. EoA was used with data collected in the field to estimate the overall probability of detecting a bat carcass, the take rate of Covered Species, and the number of Covered Species fatalities that occurred. Data used in the EoA model included number of Covered Species fatalities, fatality spatial data from all bats found during surveys, and the results of searcher efficiency and carcass persistence trials, the seasonal arrival distribution of bats, and the detection reduction factor (*k; described below*).

Fatality Rate Estimation

To estimate the all-bat fatality rate for the study period, WEST used GenEst (a generalized estimator of fatality; Dalthorp et al. 2018, Simonis et al. 2018). Carcasses included in the fatality rate estimation were found within the search areas (plots) and had an estimated time of death within the study period. Fatality estimates were calculated by season and plot type. To obtain an overall fatality estimate, each carcass included in the analysis was adjusted for searcher efficiency, carcass persistence, a detection reduction factor (also referred to as "*k*"; see below), and a search area adjustment. Estimates and 90% confidence intervals (CIs) were calculated using a parametric bootstrap (Manly 1997, Dalthorp et al. 2018). Bootstrapping is a computer simulation technique that is useful for calculating variances and CIs for complicated test statistics. One thousand bootstrap samples were used. The lower 5th and upper 95th percentiles of the 1,000 bootstrap samples were estimates of the lower limit and upper limit of 90% CIs. Fatality rate estimates were averaged across plot types within a season (i.e., 70-m cleared and uncleared plots and 100-m road and pad plots) using the number of turbines searched in each plot type as a weight in the averaging. The seasonal fatality rate estimates were then summed across seasons to obtain an overall fatality rate estimate for the study period.

Searcher Efficiency Estimation

EoA uses raw searcher efficiency data (e.g., number of found and available trial carcasses) to inform overall probability of detection. However, to determine if searcher efficiency data should be pooled, or separated by strata such as season and/or plot type, we modeled searcher efficiency using logistic regression, while accounting for the detection reduction factor *k* (Dalthorp et al. 2018). Searcher efficiency models for the all-bat fatality estimate and EoA included plot type and season as potential covariates, and searcher efficiency was modeled separately for humans and dog teams to account for different modes of detection (i.e., humans use sight, dogs use scent). For both sets of models, selection was completed using an information theoretic approach known as AICc, or corrected Akaike Information Criterion (Burnham and Anderson 2002). The best model was selected as the most parsimonious model within two AICc units of the

model with the lowest AICc value. Searcher efficiency values were input into the EoA software according to the model selection results.

The change in searcher efficiency between successive searches was defined by a parameter called the detection reduction factor (k) that can range from zero to one. When k is zero, it implies a carcass that was missed on the first search would never be found on subsequent searches. A k of one implies searcher efficiency remained constant no matter how many times a carcass was missed. Huso et al. (2017) estimated a value of k = 0.67 for bats, and this value was used to calculate bat fatality estimates using EoA per the HCP.

Carcass Persistence Rate Estimation

Data collected during carcass persistence trials were used to estimate the amount of time, in days, that carcasses remained available to be located by the searcher. The average probability a carcass persisted through the search interval (i.e., the time between scheduled searches) was estimated using an interval-censored survival regression with four potential distributions: exponential, log-logistic, lognormal, and Weibull distributions (Kalbfleisch and Prentice 2002, Dalthorp et al. 2018) As with searcher efficiency, carcass persistence models were estimated separately by search team (i.e., plots searched by technicians vs. plots searched by dog-handler teams) to account for different modes of detection. Season was included as a potential covariate for the technician model while season and plot type (road and pad, cleared plot, and uncleared plot) were included as potential covariates for the dog-handler model. The best model was selected as the most parsimonious model within two AICc units of the model with the lowest AICc value. The parameter estimates of the selected model (α [shape] and β [scale], including the 95% Confidence Interval [CI] of β) were used as inputs in the EoA Single Class module.

Area Adjustment

The search area adjustment accounted for unsearched areas beneath turbines, and was calculated as a probability that ranged from zero to one. The area adjustment was estimated as the product of the searched area around each turbine and a carcass-density distribution. A truncated weighted maximum likelihood (TWL) modeling approach (Khokan et al. 2013) was used to estimate the carcass-density distribution using site-specific fatality locations. The TWL approach uses weight based probability of detection and the proportion of area searched in each 1.0-m annulus around the turbine. Distributions considered were normal, gamma, Gompertz, and Weibull (parameterized according to R Development Core Team [2016] and Yee [2015]). The best model was selected using AICc. The proportion of area searched was calculated in GIS as the amount of area searched divided by the total area searched at each 1.0-m annulus around the turbine.

Carcasses Excluded from Area Correction Calculations

Fatalities were excluded from both the area adjustment used in EoA and the all-bat fatality estimates when the carcass was discovered outside of the spatial and temporal scope of the survey design. For example, carcasses found outside a designated plot were not included in the analysis because the area adjustment accounts for the carcass by adjusting for unsearched areas. Carcasses found prior to the start of surveys (e.g., a carcass found on a plot in the summer

that is not searched until the fall) were also excluded because the carcass occurred outside of the study period. Note that carcasses found on a plot incidentally were included in the analysis if that plot had a scheduled search in the future. If a fatality of a Covered Species had been found outside of the spatial or temporal scope of the survey design it would still be excluded from the area correction estimate, but would be included in the EoA fatality estimate following Dalthorp et al. (2020).

Indiana Bat and Northern Long-eared Bat Take and Detection Probability Estimates

<u>Evidence of Absence</u>

EoA was used to estimate the median cumulative take to-date (*M**), the mean annual take rate (λ), and evaluate the probability that the estimated take rate (λ) exceeded the expected take rate (τ) for Indiana bat and northern long-eared bat. Estimates were calculated using the EoA method (Dalthorp et al. 2017), using the Single Class, Multiple Class, and Multiple Years modules of EoA.

The probability of detection (*g*) was estimated using the bias corrections for searcher efficiency, carcass persistence, the area correction, the fraction to which searcher efficiency was reduced with each successive search (k), and the phenology of bat fatalities (i.e. proportion of fatalities expected to occur during each season). Searcher efficiency, carcass persistence probability, and the search area adjustment (area correction in EoA) were estimated as described above. The fraction to which searcher efficiency was reduced with each successive search, or k, will be 0.67, as assumed in the HCP. The *Myotis* arrival proportions were set to 0.07 in spring, 0.36 in summer and 0.57 in fall as described in the Project's study plan.

The EoA Single Class module was used to estimate the detection probability in each search stratum. This resulted in alpha and beta parameters that defined the beta distribution of detection probability in each stratum. The area correction for each stratum was included in the Single Class Module as the "Spatial Coverage (a)" input. The EoA Multiple Class module was then used to combine detection probability distributions across strata (cleared plots, uncleared plots, and roads and pads), with weights for each class ("DWP" in the software) defined by the within-season sampling fraction, as well as across seasons. The results from the Multiple Years module (Ba and Bb parameters for the detection probability to date) were used to estimate *M** (the median cumulative take over the life of the permit), and mean take rate λ and its 95% CI. The mean annual take rate λ was used to evaluate the short-term adaptive management trigger and the cumulative take estimate *M** was used to evaluate the long-term adaptive management trigger (see *Adaptive Management Triggers* section below). Appendix C shows detailed inputs needed if using the EoA Graphical User Interface.

The EoA Multiple Years Module was used to estimate the site-wide, cumulative detection probability for monitoring periods in 2021 and 2022. The EoA Multiple Years Module requires the input ρ, which weights the years appropriately for combining Beta distribution parameters. In 2021, the Project ITP was issued part way through the summer season. To account for the incomplete summer season, 2021 ρ was calculated using adjusted seasonal arrival proportions. The full summer arrival proportion (0.36) was adjusted to reflect the proportion of the summer that was searched. The adjusted summer arrival proportion (0.19) was combined with the full fall

arrival proportion (0.57) to yield a ρ of 0.76 for 2021. This means that 76% of total annual risk was observed in monitoring data from 2021. In 2022, the Project was fully operational for all seasons, so ρ was set to 1.

Adaptive Management Triggers

The estimates from the EoA analysis were used to test two adaptive management triggers: a short-term test of whether the estimated take rate exceeded the expected take rate and a long-term test of whether permitted take had been met (Dalthorp and Huso 2015). Both the short- and long-term triggers were tested individually for each of the Covered Species.

Evidence of Absence Short-term Trigger

The EoA short-term trigger is designed as an early warning signal that the project may be on the path to exceeding permitted take (T) by the end of the permit term. The short-term trigger is designed to determine if an adaptive management response is needed to prevent the cumulative take estimate from actuating a response to the long-term trigger test. The short-term trigger tests if the estimated annual take rate (λ) exceeded the expected take rate (τ = T ÷ years in permit) at a confidence level of α = 0.05, per the HCP. Data from two monitoring periods were used in this analysis (2021 and 2022) along with the values of ρ listed above (0.76 and 1.0, respectively). Due to limitations with the EoA graphical user interface, for estimates of λ it was necessary to rescale the EoA-produced estimates to represent two full years of operation and monitoring using the sum of these ρ values. For adaptive management triggers associated with λ, it was necessary to scale the annual rate threshold (τ) to represent the level of risk in the moving average estimate of λ.

The Project's short-term trigger is designed to evaluate a rolling window of seven years of post-construction monitoring data. If, within any seven-year rolling window, the estimated take rate exceeds the expected take rate with 95% confidence, the short-term trigger would be met. If the short-term trigger is met, HCP section 5.4.3 sets forth adaptive management responses the Applicant should consider prior to the next monitoring cycle.

Evidence of Absence Long-term Trigger

The EoA long-term trigger is designed to test if the cumulative take to date is equal to or greater than the permitted take (T). Per the HCP, cumulative take to date (*M**) was estimated at a confidence level of α = 0.5 (using the median, or 50th credible bound, of the posterior distribution of estimated mortality). If the cumulative take to date at α = 0.5 is less than the total permitted take (*M** < T), then the Project is in compliance with the ITP. If the cumulative take to date at α = 0.5 is greater than or equal to the total permitted take (*M** ≥ T), then the take limit has been met and the Project must enact avoidance measures.

RESULTS

Standardized Carcass Searches

In spring all 52 turbines were search weekly as road and pads. In the summer, 21 turbines were searched weekly as road and pads, eight turbines were searched weekly as cleared plots, and eight turbines were searched weekly as uncleared plots. In the fall, 36 turbines were searched twice weekly as road and pads, eight turbines were searched twice weekly as cleared plots, and eight turbines were seared twice weekly as uncleared plots. Between spring, summer, and fall monitoring, 1,823 searches were conducted (Table 3). Thirty-seven searches (less than 2.0%) were missed due to turbine maintenance, weather constraints, and/or safety hazards. Five hundred thirty two bat carcasses and 95 bird carcasses were found during this surveys and incidentally (Appendix A). Appendix A documents the birds that were recorded during this survey; the remainder of the results focuses on the bat-related study.

Table 3. **Number of searches per plot type at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.**

Season	Plot Type	Search Interval	Number of Searches
Spring (April 1 – May 15)	100-m road and pad	Weekly	306
Summer (May 16 – July 31)	100-m road and pad	Weekly	231
	70-m cleared plot	Weekly	87
	70-m uncleared plot	Weekly	88
Fall (August 1 – October 15)	100-m road and pad	Twice weekly	764
	70-m cleared plot	Twice weekly	176
	70-m uncleared plot	Twice weekly	171

m = meter.

Species Composition

The most commonly found bat species were eastern red bat (191 carcasses; 35.9%) and silver-haired bat (142; 26.7%), followed by big brown bat (120; 22.6%) and hoary bat (65; 12.2%). The remaining species composed less than 3.0% of the total bats found. (Table 4, Appendix A). Species composition recorded at the Project was similar to ITP monitoring conducted in 2021. Five bats were found in spring, 85 bats were found in the summer, and 442 bats were found in the fall (Appendix A). Five heavily scavenged bats (e.g., wing membrane only, bones, or partial carcasses) were sent off for identification via DNA analysis; DNA analysis identified these as three big brown bats and two silver-haired bats. The majority of bat carcasses were recorded on plots searched by dog handler teams (Tables 5a, 5b, 5c).

Three Indiana bat carcasses were found during post-construction monitoring surveys: one on August 30, 2022, at Turbine 17, and two on October 7, 2022, at turbines 36 and 39 (Figure 2). The Indiana bats were identified by a permitted bat biologist (TE234121-9) and reported to USFWS and IDNR on August 31 and October 7, 2022. The carcass found at turbine 36 on October 7 was originally identified as an unidentified *Myotis* and a sample was sent for DNA testing for verification of species. Verification of Indiana bat DNA was received from Dr. Jane Huffman Wildlife Genetics Institute on November 18, 2022. The estimated time of death of the Indiana bat

found in August was two to three days prior to discovery while the estimated time of death for the bats found on October 7 were zero to one day prior and four to seven days prior. Scavenging and decomposition of the carcasses prior to finding them prevented assignment of sex. DNA analysis identified the Indiana bat carcass found on August 30 as a male and the Indiana bat carcasses found on October 7 at Turbine 36 as female and at Turbine 39 as male. All Indiana bat carcasses were transferred to Julia Kemnitz at the USFWS Indiana Ecological Services Field Office. No northern long-eared bat carcasses were found during the study. Five state-listed endangered evening bat (*Nycticeius humeralis*) were also found during summer and fall surveys. One evening bat was found at Turbine 49 on May 20, one was found at Turbine 14 on May 31, one was found at Turbine 33 on June 23, and one was found at Turbine 49 on August 26, 2022. An additional evening bat was identified in December 2022 from review of a highly decayed carcass originally found on June 23, 2022, at Turbine 33 (Figure 2).
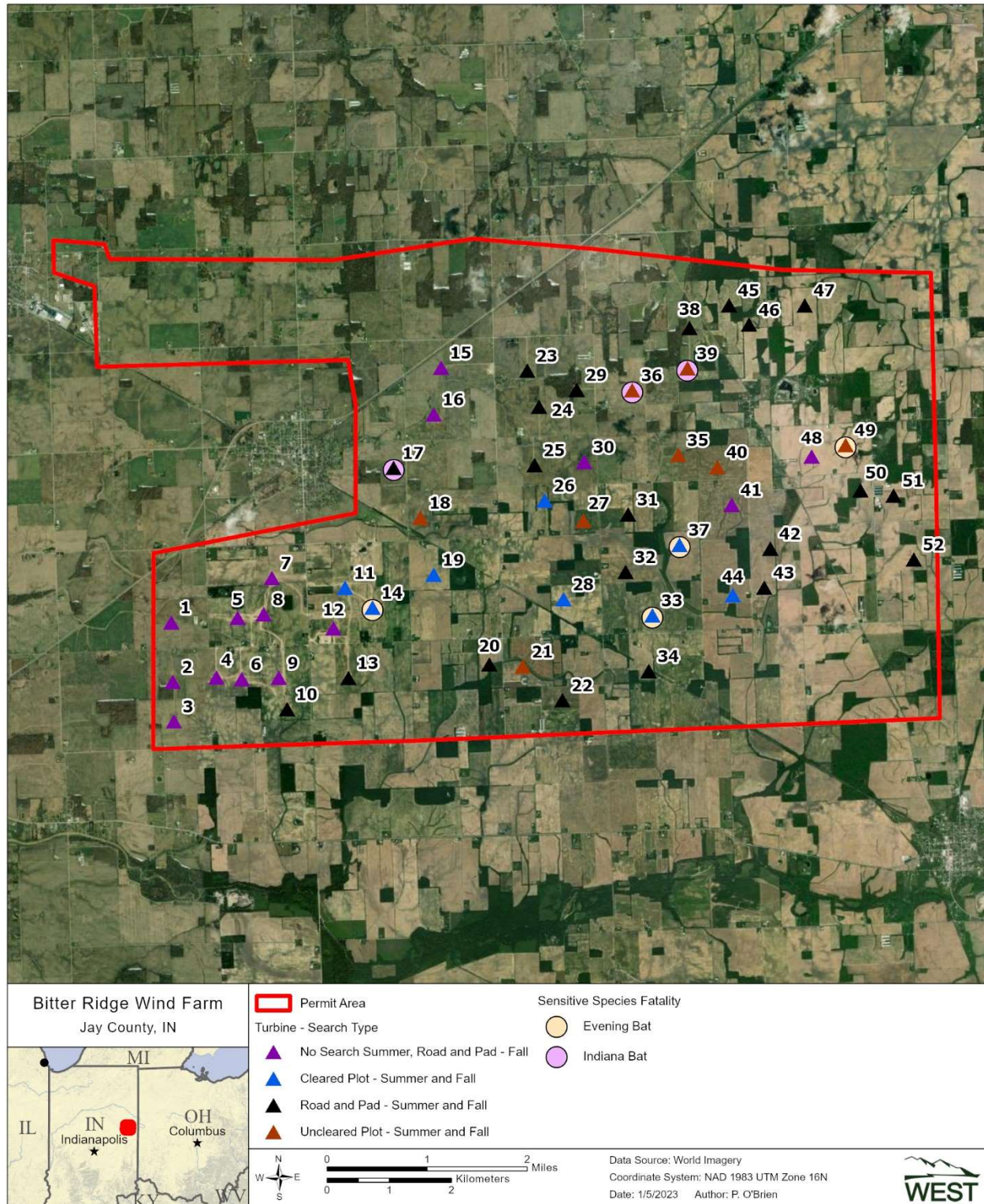
Figure 2.   Location of state- and federally listed carcasses in relation to turbines at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Table 4. **Number and percent (%) of bat carcasses found at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.**

Species	Included in Area Correction		Outside Search Area*		Outside Study Period*		Total	
	Total	%	Total	%	Total	%	Total	%
eastern red bat	180	36.29	8	34.78	4	30.77	192	36.09
silver-haired bat	136	27.42	4	17.39	3	23.08	143	26.88
big brown bat	113	22.78	4	17.39	1	7.69	118	22.18
hoary bat	55	11.09	5	21.74	4	30.77	64	12.03
Seminole bat	6	1.21	1	4.35	0	0	7	1.32
evening bat	3	0.60	1	4.35	1	7.69	5	0.94
Indiana bat	3	0.60	0	0	0	0	3	0.56
Total	**496**	**100**	**23**	**100**	**13**	**100**	**532**	**100**

* Carcasses not included in analysis.

Sums may not equal total values shown due to rounding.

Carcasses for Area Correction Analysis

Thirty-six of the 532 bats found during monitoring season were excluded from modeling the area correction for EoA; 23 bat carcasses were excluded from analysis because they were found off plot. Another 13 bats were excluded because their estimated time of death was prior to the start of surveys (Table 4).

Table 5a. **Species composition on 100-meter road and pad by season for bat carcasses* found at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.**

Species	Spring		Summer		Fall	
	# of Carcasses	%	# of Carcasses	%	# of Carcasses	%
eastern red bat	0	0	3	33.33	30	29.41
silver-haired bat	3	100	1	11.11	27	26.47
big brown bat	0	0	2	22.22	35	34.31
hoary bat	0	0	3	33.33	5	4.9
Seminole bat	0	0	0	0	4	3.92
evening bat	0	0	0	0	0	0
Indiana bat	0	0	0	0	1	0.98
Total	**3**	**100**	**9**	**100**	**102**	**100**

* This table only includes bat carcasses included in the area correction calculation.

Sums may not equal total values shown due to rounding.

Table 5b.   Species composition on 70-meter cleared plot by season for bat carcasses* found at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

	Summer		Fall	
Species	# of Carcasses	%	# of Carcasses	%
eastern red bat	16	44.44	77	37.38
silver-haired bat	9	25	60	29.13
big brown bat	3	8.33	46	22.33
hoary bat	6	16.67	21	10.19
Seminole bat	0	0	2	0.97
evening bat	2	5.56	0	0
Indiana bat	0	0	0	0
Total	**36**	**100**	**206**	**100**

* This table only includes bat carcasses included in the area correction calculation.

Sums may not equal total values shown due to rounding.

Table 5c.   Species composition on 70-meter uncleared plot by season for bat carcasses* found at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

	Summer		Fall	
Species	# of Carcasses	%	# of Carcasses	%
eastern red bat	9	34.62	45	39.47
silver-haired bat	5	19.23	31	27.19
big brown bat	4	15.38	23	20.18
hoary bat	8	30.77	12	10.53
Seminole bat	0	0	0	0
evening bat	0	0	1	0.88
Indiana bat	0	0	2	1.75
Total	**26**	**100**	**114**	**100**

* This table only includes bat carcasses included in the area correction calculation.

Sums may not equal total values shown due to rounding.

Bias Trials

Searcher Efficiency Trials

One hundred seventy-five bats were placed for searcher efficiency trials on 12 separate dates (April 11 and 19, May 31, June 23, July 6 and 21, August 15 and 31, September 12 and 21, and October 5 and 10, 2022), and 149 were available for search teams to find across all plot types. Searcher efficiency rates ranged from 68.0% on 70-m uncleared plots searched by dog teams to 95.7% on 70-m cleared plots searched by dog teams (Table 6). The best-fit model for searcher efficiency on 70-m plots did not support the inclusion of plot type as a covariate, meaning there was not a substantial difference between searcher efficiency rates on uncleared and cleared plots or between seasons (Table 7). The best-fit model for searcher efficiency on non-aided, 100-m road and pads did not support the inclusion of season as a covariate (Table 8). Thus, the total number of available and found searcher efficiency trials were summed across seasons for aided and non-unaided plot types, which maintained the stratification of 70-m cleared plots, 70-m uncleared plots, and 100-m road and pad plots. The inputs for the 70-m cleared plots were 45 available carcasses and 41 found carcasses for all seasons. The inputs for the 70-m uncleared

plots were 42 available carcasses and 32 found carcasses for all seasons. The inputs for road and pad plots were 62 available carcasses and 57 found carcasses for all seasons (Table 6).

Table 6. Searcher efficiency results by plot type at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Season	Plot Type	Number Placed	Number Available	Number Found	% Found
Spring	100-m road and pads	20	17	16	94.1
	70-m cleared plots	25	22	19	86.4
Summer	70-m uncleared plots	19	17	15	88.2
	100-m road and pads	21	18	17	94.4
	70-m cleared plots	26	23	22	95.7
Fall	70-m uncleared plots	29	25	17	68.0
	100-m road and pads	35	27	24	88.9
Overall 70-m cleared aided plots		**51**	**45**	**41**	**91.1**
Overall 70-m uncleared aided plots		**48**	**42**	**32**	**76.2**
Overall 100-m unaided road and pads		**76**	**62**	**57**	**91.9**
Overall		**175**	**149**	**130**	**87.3**

m = meter.

Table 7. Searcher efficiency models for 70-meter aided plots at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Covariates	k Value	AICc	Delta AICc
Plot Search Type	k fixed at 0.67	77.24	0
Season x PlotSearchType	k fixed at 0.67	77.90	0.66
No Covariates	k fixed at 0.67	78.81	1.57*
Season + PlotSearchType	k fixed at 0.67	79.02	1.78
Season	k fixed at 0.67	80.34	3.10

* Selected model.

AICc = Corrected Akaike Information Criterion.

Delta AICc = Change in AICc.

n = 87.

Table 8. Searcher efficiency models for 100-meter non-aided road and pads at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Covariates	k Value	AICc	Delta AICc
No covariates	0.67	36.83	0*
Season	0.67	40.58	3.75

* Selected model.

AICc = corrected Akaike Information Criterion.

Delta AICc = Change in AICc.

n = 62.

Carcass Persistence Trials

Forty-five carcasses were placed to estimate carcass persistence on unaided roads and pads and 60 carcasses were placed to estimate carcass persistence on aided cleared and uncleared plots combined. The best-fit model for carcass persistence rates on roads and pads had no covariates with a loglogistic distribution, and suggests bat carcass persistence rates on roads and pads did not vary by season (Table 9). The best-fit model for carcass persistence rates on dog-aided search plots had no covariates with a Weibull distribution, and suggests bat carcass persistence rates did not vary by season or dog-aided plot type (Table 10). The estimated median carcass persistence times ranged from 5.3 days on 100-m road and pads to 11.6 days on 70-m plots (Table 11). The average probability a carcass persisted through a 3.5-day search interval ranged from 0.66 (90% CI: 0.57–0.74) on 100-m road and pads in the summer to 0.85 (90% CI: 0.78–0.91) on 70-m cleared and uncleared plots in the fall (Table 12, Figure 3).

Table 9. **Carcass persistence models with covariates and distributions for technician searched roads and pads at the Bitter Ridge Wind Energy Project, Jay County, Indiana, from April 1 – October 15, 2022.**

Location Covariates	Scale Covariates	Distribution	AICc	Delta AICc
No Covariates	No Covariates	loglogistic	206.42	0*
No Covariates	No Covariates	lognormal	207.06	0.64
No Covariates	No Covariates	Weibull	207.90	1.48
No Covariates	-	exponential	208.60	2.18
No Covariates	Season	loglogistic	211.05	4.63
No Covariates	Season	Weibull	211.11	4.69
Season	No Covariates	loglogistic	211.13	4.71
No Covariates	Season	lognormal	211.44	5.02
Season	No Covariates	lognormal	211.53	5.11
Season	No Covariates	Weibull	211.80	5.38
Season	-	exponential	211.98	5.56
Season	Season	Weibull	215.91	9.49
Season	Season	loglogistic	216.25	9.83
Season	Season	lognormal	216.41	9.99

* Selected model.

AICc = Corrected Akaike Information Criterion.

Delta AICc = Change in AICc.

n = 45.

Table 10. **Carcass persistence models with covariates and distributions for dog-aided plot searches at the Bitter Ridge Wind Energy Project, Jay County, Indiana, from April 1 – October 15, 2022.**

Location Covariates	Scale Covariates	Distribution	AICc	Delta AICc
No Covariates	No Covariates	Weibull	263.10	0*
PlotSearchType	No Covariates	Weibull	263.98	0.88
Season	No Covariates	Weibull	264.55	1.45
Season + PlotSearchType	No Covariates	Weibull	264.93	1.83
No Covariates	Season	Weibull	265.29	2.19
No Covariates	PlotSearchType	Weibull	265.32	2.22
No Covariates	No Covariates	loglogistic	265.39	2.29
PlotSearchType	Season	Weibull	265.98	2.88

Table 10. **Carcass persistence models with covariates and distributions for dog-aided plot searches at the Bitter Ridge Wind Energy Project, Jay County, Indiana, from April 1 – October 15, 2022.**

Location Covariates	Scale Covariates	Distribution	AICc	Delta AICc
No Covariates	-	exponential	266.07	2.97
No Covariates	No Covariates	lognormal	266.17	3.07
PlotSearchType	PlotSearchType	Weibull	266.28	3.18
PlotSearchType	No Covariates	loglogistic	266.28	3.18
PlotSearchType	-	exponential	266.47	3.37
Season	PlotSearchType	Weibull	266.80	3.70
Season	Season	Weibull	266.82	3.72
Season + PlotSearchType	Season	Weibull	266.92	3.82
Season + PlotSearchType	-	exponential	266.99	3.89
Season	No Covariates	loglogistic	267.18	4.08
Season + PlotSearchType	PlotSearchType	Weibull	267.19	4.09
Season	-	exponential	267.35	4.25
PlotSearchType	No Covariates	lognormal	267.41	4.31
No Covariates	PlotSearchType	loglogistic	267.48	4.38
No Covariates	Season + PlotSearchType	Weibull	267.59	4.49
No Covariates	Season	loglogistic	267.59	4.49
Season	No Covariates	lognormal	267.77	4.67
Season + PlotSearchType	No Covariates	loglogistic	268.07	4.97
No Covariates	PlotSearchType	lognormal	268.22	5.12
PlotSearchType	Season + PlotSearchType	Weibull	268.36	5.26
No Covariates	Season	lognormal	268.37	5.27
PlotSearchType	Season	loglogistic	268.41	5.31
PlotSearchType	PlotSearchType	loglogistic	268.42	5.32
Season + PlotSearchType	No Covariates	lognormal	268.95	5.85
Season	Season + PlotSearchType	Weibull	269.15	6.05
Season + PlotSearchType	Season + PlotSearchType	Weibull	269.22	6.12
Season	PlotSearchType	loglogistic	269.23	6.13
PlotSearchType	PlotSearchType	lognormal	269.43	6.33
Season	Season	loglogistic	269.45	6.35
PlotSearchType	Season	lognormal	269.61	6.51
No Covariates	Season + PlotSearchType	loglogistic	269.74	6.64
Season	PlotSearchType	lognormal	269.74	6.64
Season	Season	lognormal	270.03	6.93
Season + PlotSearchType	PlotSearchType	loglogistic	270.15	7.05
Season + PlotSearchType	Season	loglogistic	270.27	7.17
No Covariates	Season + PlotSearchType	lognormal	270.48	7.38
PlotSearchType	Season + PlotSearchType	loglogistic	270.58	7.48
Season + PlotSearchType	PlotSearchType	lognormal	270.81	7.71
Season + PlotSearchType	Season	lognormal	271.15	8.05
Season	Season + PlotSearchType	loglogistic	271.55	8.45
PlotSearchType	Season + PlotSearchType	lognormal	271.64	8.54
Season	Season + PlotSearchType	lognormal	272.03	8.93
Season + PlotSearchType	Season + PlotSearchType	loglogistic	272.35	9.25
Season + PlotSearchType	Season + PlotSearchType	lognormal	272.95	9.85

* Selected model.

AICc = Corrected Akaike Information Criterion.

Delta AICc = Change in AICc.

n = 60.

Table 11. Carcass persistence top model with covariates, distributions, and model parameters for the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Plot Search Type	Distribution	Estimated Median Removal Times (days)	Parameter 1	Parameter 2
100-m road and pads	loglogistic*	5.34	shape=0.798	scale=1.675
70-m dog-aided plots	Weibull**	11.62	shape=0.7463	scale=18.9917

* Parameterization follows the FAdist parameterization for this distribution.

** Parameterization follows the base R parameterization for this distribution.

m = meter.

Table 12. Probability a carcass would persist through the search interval for the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Season	Plot Type	Search interval (days)	Average probability of persistence through search interval	90% Confidence Interval
Spring	100-m road and pad	Weekly (6.8)	0.67	0.58 - 0.75
Summer	100-m road and pad	Weekly (7.1)	0.66	0.57 - 0.74
	70-m dog aided plot	Weekly (7.1)	0.77	0.70 - 0.84
Fall	100-m road and pad	Twice Weekly (3.6)	0.80	0.72 - 0.87
	70-m dog aided plot	Twice Weekly(3.5)	0.85	0.78 - 0.91

m = meter.
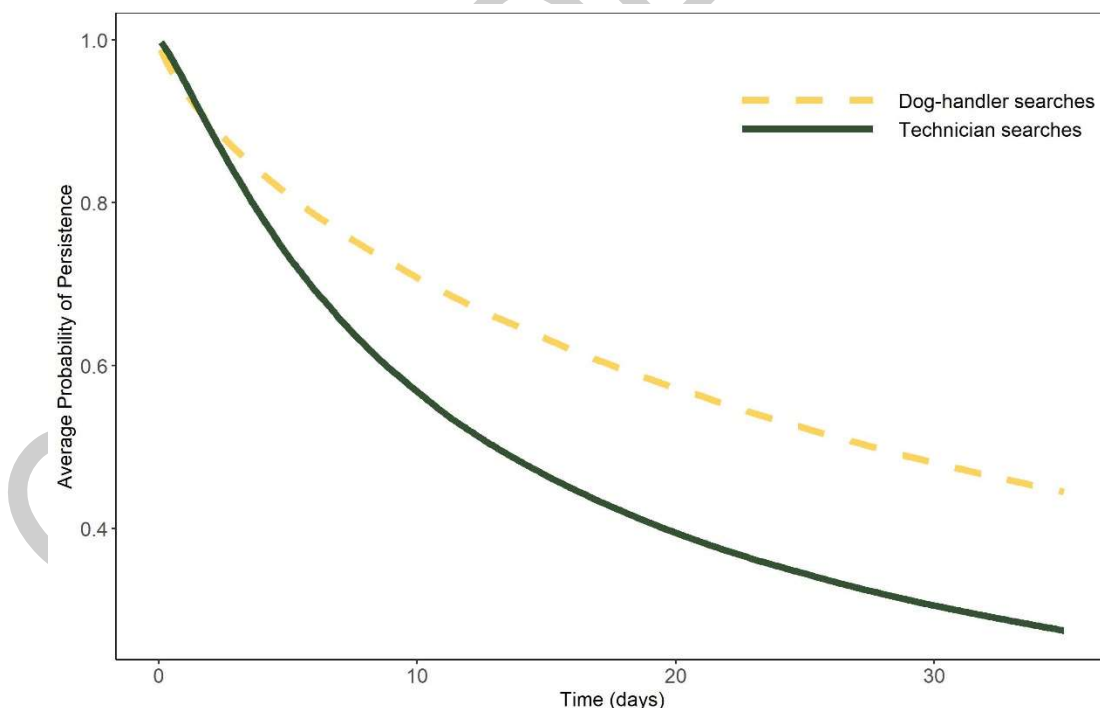
Figure 3. The average probability of persistence, in days, at Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Statistical Analysis

Area Correction

The best-fit model for the distribution of bats with respect to distance from turbine base was a Weibull distribution (Appendix B1). The TWL area correction for bats was estimated to be 0.95 for 70-m cleared plots, 0.92 for 70-m uncleared plots, and 0.10 for 100-m road and pads (Appendix B2; Figure 4).
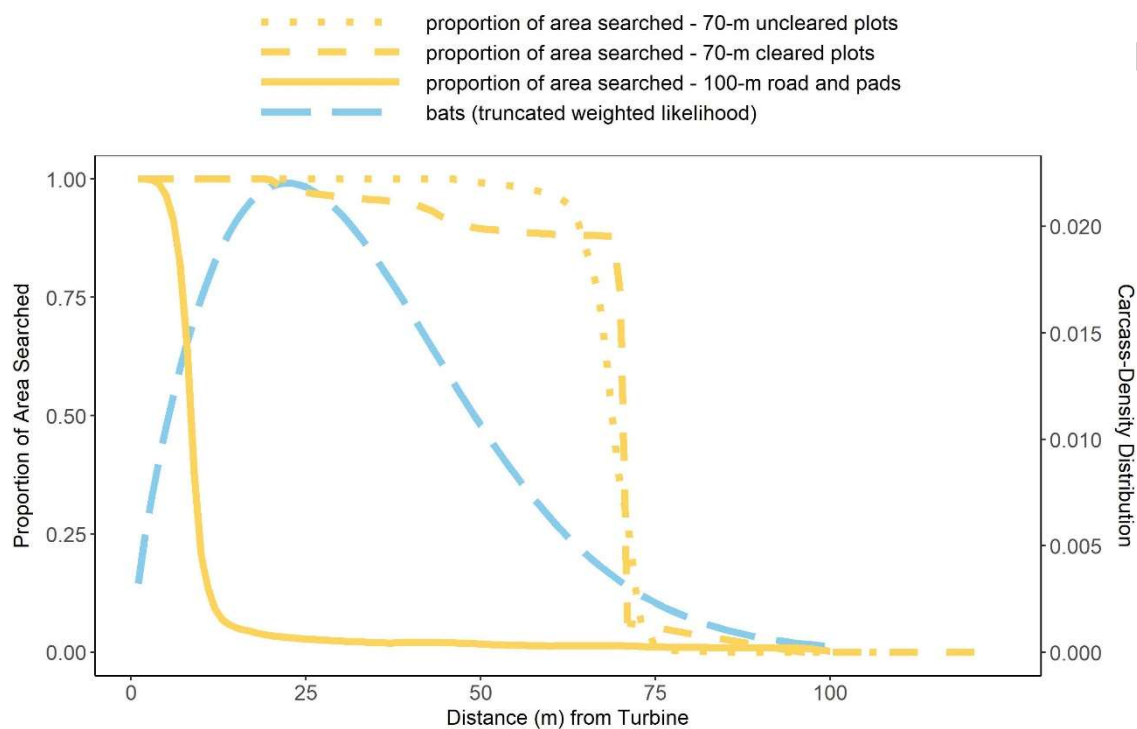
Figure 4.   Density of bat carcasses per area searched at all roads and pads, cleared plots, and uncleared plots at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Adjusted Overall Bat Fatality Estimates

Bat fatality estimates were calculated for the year, per the ITP. Fatality estimates were highest in the fall, and the overall estimate for the study was 15.84 bats per MW (90% CI: 12.08–21.59; Table 13).

Table 13. **Overall bat fatality rates per turbine and megawatt using GenEst for studies conducted at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.**

Season	Bat Fatality Estimate per Turbine	90% Confidence Limits	Bat Fatality Estimate per Megawatt	90% Confidence Limits
Spring	0.92	n/a*	0.33	n/a*
Summer	7.06	4.49 - 10.63	2.52	1.60 - 3.79
Fall	36.25	27.55 - 50.03	12.95	9.84 - 17.87
Overall	**44.35**	**33.82 - 60.44**	**15.84**	**12.08 - 21.59**

* Confidence interval not calculated because the observed carcass count is less than 5.

Indiana Bat and Northern Long-eared Bat Take Estimates

Evidence of Absence Framework

Three Indiana bats and zero northern long-eared bat carcasses were found during the study. The overall probability of detection distribution achieved for the 2022 monitoring period had a mean of 0.28 (95% CI: 0.26–0.29; Table 14). The estimated *g* of 0.28 and 95% CI exceed the target probability of detection value (0.25), indicating the realized *g* for the 2022 monitoring period is statistically greater than the target *g*. The overall probability of detection distribution achieved over both years of ITP level monitoring had a mean of 0.30 (95% CI: 0.29–0.31) and is also greater than the overall target probability of detection value. Inputs required to run the EoA Single Class module and stratum-specific *g* distribution values and inputs required for the Multiple Class module are described in Appendix C.

Table 14. **Annual and overall probabilities of detection (*g*), Ba, Bb, and ρ for the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.**

Year	Ba*	Bb*	ρ**	g	95% Confidence Intervals
2021	1,559.98	3,145.32	0.76	0.33	0.32 - 0.35
2022	1,613.63	4,226.04	1	0.28	0.26 - 0.29
Overall	**3,178.87**	**7,411.56**	**1.76**	**0.30**	**0.29 - 0.31**

* Ba and Bb are the parameters for the beta distribution used to characterize the probability of detection. The *g* value is the mean of that distribution.

** ρ is the weight in the weighted average that is used to combine the probability of detection distributions across years.

The expected average annual take rate reported in the HCP is 1.95 Indiana bats per year and 1.37 northern long-eared bats per year; the total permitted take for each species is 69 Indiana bats and 45 northern long-eared bat over the 35-year permit term. Based on the second year of ITP monitoring, take to-date, M^* at α = 0.5 (50th credible bound), is estimated to be 17 Indiana bats and 0 northern long-eared bats (Table 15). These values fall below the permitted take level for both species, meaning the Project is in compliance with the ITP. The mean annual take rate (λ) was estimated to be 10.41 (95% CI = 3.61–20.76) Indiana bats per year and 0.95 (95% CI = <0.01–4.76) northern long-eared bats per year (Table 15). Based on these data, the probability that estimated annual take exceeded expected annual take did not exceed 95% for northern long-eared bat, but Indiana bat annual take did exceed the 95% short-term adaptive management trigger. Therefore adaptive management responses warrant consideration in accordance with HCP section 5.4.3.

Table 15. Cumulative take estimate to date using Evidence of Absence for studies conducted at Bitter Ridge Wind Farm, Jay County, Indiana in 2021 and 2022.

Species	Cumulative Take (M*)	Mean Annual Take Rate (λ)
Indiana bat	17 (50th credible bound)	10.41 (95% CI = 3.61 - 20.76)
northern long-eared bat	0 (50th credible bound)	0.95 (95% CI = <0.01 - 4.76)

CI = confidence interval.

DISCUSSION

During the study, a total of 532 bat fatalities were found. The overall bat fatality rate was 15.84 bats per MW (90% CI: 12.08–21.59).The most commonly found bat species were eastern red bat (35.9%), silver-haired bat (26.7%), big brown bat (22.6%), and hoary bat (12.2%). Species composition recorded at the Project was similar to previous studies last year at Bitter Ridge, and at Headwaters Wind Farm, a nearby wind farm in Randolph County, Indiana (Rodriguez et al. 2020, 2021).

The overall probability of detection (*g*) distribution for 2022 post-construction monitoring surveys had a mean of 0.28 (95% CI: 0.26–0.29). Thus, overall *g* for 2022 exceeded the target *g* of 0.25 for the monitoring period, indicating that the detection probability was higher than expected for post-construction monitoring surveys in 2022. Carcasses on technician searched road and pads had a predicted median removal time of 5.3 days while dog-aided plots had a predicted median removal time of 11.6 days. Carcass persistence trials indicated persistence times in 2022 were longer than the shortest search interval confirming that 3.5 day search interval in fall was sufficient to detect the majority of bat carcasses. The area correction data from Bitter Ridge indicated that nearly all bat fatalities (0.1–0.95) occurred within 70 meters of turbines. These factors were responsible for the overall probability of detection exceeding the target *g* in 2022.

Three Indiana bat carcasses were found during post-construction monitoring surveys: one on August 30, 2022, at Turbine 17, and two on October 7, 2022, at turbines 36 and 39. No northern long-eared bat carcasses were found. Based on two years of ITP monitoring, take to-date, *M** at α = 0.5 (50th credible bound), is estimated to be 17 Indiana bats and zero northern long-eared bats. Estimated take for the Covered Species falls below the permitted take level for both species, meaning the Project is in compliance with the ITP. The EoA model estimated the mean annual fatality rate at Bitter Ridge was 10.41 Indiana bats and 0.95 northern long-eared bats. The probability that the annual take rate exceeded the short-term thresholds for northern long-eared bat did not exceed 95%, but they did exceed 95% for Indiana bat. HCP Section 5.4.3 provides direction on adaptive management responses in the event the short term threshold is exceeded. Consistent with HCP section 5.4.4, Bitter Ridge will be scheduling a meeting with the USFWS to discuss this study and potential adaptive management responses. .

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Appendix A. Carcasses Found during the 2022 Post-construction Monitoring Surveys at the Bitter Ridge Wind Farm

Appendix A. Carcasses found at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Found Date	Species	Distance from Turbine	Turbine	Search Type	Search Area Type	Physical Condition	Aided Search
Bats							
04/05/2022	eastern red bat	5	20	carcass search	100-m road and pads	scavenged	no
04/25/2022	silver-haired bat	1	4	carcass search	100-m road and pads	scavenged	no
05/03/2022	hoary bat	8	27	carcass search**	100-m road and pads	intact	no
05/03/2022	silver-haired bat	1	46	carcass search	100-m road and pads	scavenged	no
05/10/2022	silver-haired bat	66	39	carcass search	100-m road and pads	scavenged	no
05/16/2022	eastern red bat	58	14	carcass search	70-m cleared plots	scavenged	yes*
05/16/2022	hoary bat	44	18	carcass search	70-m uncleared plots	scavenged	yes*
05/16/2022	hoary bat	5	21	carcass search	70-m uncleared plots	scavenged	yes*
05/16/2022	silver-haired bat	40	14	carcass search	70-m cleared plots	scavenged	yes*
05/17/2022	eastern red bat	21	27	carcass search	70-m uncleared plots	scavenged	yes*
05/17/2022	silver-haired bat	21	19	carcass search	70-m cleared plots	scavenged	yes*
05/18/2022	hoary bat	54	18	incidental	70-m uncleared plots	scavenged	yes*
05/19/2022	big brown bat	20	28	carcass search	70-m cleared plots	scavenged	yes*
05/19/2022	hoary bat	39	36	carcass search	70-m uncleared plots	dismembered	yes*
05/19/2022	hoary bat	0	40	carcass search	70-m uncleared plots	scavenged	yes*
05/20/2022	silver-haired bat	32	37	carcass search	70-m cleared plots	scavenged	yes*
05/20/2022	eastern red bat	11	49	carcass search	70-m uncleared plots	scavenged	yes*
05/20/2022	evening bat	47	49	carcass search	70-m uncleared plots	scavenged	yes*
05/23/2022	big brown bat	57	11	carcass search	70-m cleared plots	scavenged	yes*
05/23/2022	eastern red bat	65	14	carcass search	70-m cleared plots	scavenged	yes*
05/23/2022	hoary bat	43	14	carcass search	70-m cleared plots	scavenged	yes*
05/24/2022	silver-haired bat	43	19	carcass search	70-m cleared plots	scavenged	yes*
05/26/2022	eastern red bat	28	34	carcass search	100-m road and pads	scavenged	no
05/26/2022	silver-haired bat	41	33	carcass search	70-m cleared plots	intact	yes*
05/31/2022	eastern red bat	36	14	carcass search	70-m cleared plots	scavenged	yes*
05/31/2022	evening bat	64	14	carcass search	70-m cleared plots	intact	yes*
05/31/2022	hoary bat	22	25	carcass search	100-m road and pads	feather spot	no
05/31/2022	silver-haired bat	33	14	carcass search	70-m cleared plots	scavenged	yes*
05/31/2022	silver-haired bat	49	18	carcass search	70-m uncleared plots	scavenged	yes*
06/01/2022	hoary bat	11	28	carcass search	70-m cleared plots	scavenged	yes*
06/01/2022	silver-haired bat	38	19	carcass search	70-m cleared plots	feather spot	yes*
06/02/2022	hoary bat	6	36	carcass search	70-m uncleared plots	intact	yes*
06/03/2022	eastern red bat	48	49	carcass search	70-m uncleared plots	scavenged	yes*
06/03/2022	eastern red bat	29	49	carcass search	70-m uncleared plots	scavenged	yes*
06/06/2022	silver-haired bat	33	10	carcass search	100-m road and pads	intact	no
06/07/2022	eastern red bat	59	33	carcass search	70-m cleared plots	scavenged	yes*

Appendix A. Carcasses found at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Found Date	Species	Distance from Turbine	Turbine	Search Type	Search Area Type	Physical Condition	Aided Search
06/07/2022	hoary bat	33	27	carcass search	70-m uncleared plots	scavenged	yes*
06/09/2022	eastern red bat	56	37	carcass search	70-m cleared plots	scavenged	yes*
06/09/2022	evening bat	57	37	carcass search	70-m cleared plots	scavenged	yes*
06/09/2022	silver-haired bat	46	37	carcass search	70-m cleared plots	scavenged	yes*
06/09/2022	silver-haired bat	48	44	carcass search	70-m cleared plots	scavenged	yes*
06/14/2022	eastern red bat	20	19	carcass search	70-m cleared plots	injured	yes*
06/14/2022	eastern red bat	57	28	carcass search	70-m cleared plots	scavenged	yes*
06/14/2022	silver-haired bat	48	19	carcass search	70-m cleared plots	scavenged	yes*
06/14/2022	silver-haired bat	44	19	carcass search	70-m cleared plots	scavenged	yes*
06/15/2022	eastern red bat	53	35	carcass search	70-m uncleared plots	scavenged	yes*
06/16/2022	big brown bat	44	36	carcass search	70-m uncleared plots	scavenged	yes*
06/16/2022	eastern red bat	47	33	carcass search	70-m cleared plots	dismembered	yes*
06/16/2022	hoary bat	54	40	carcass search	70-m uncleared plots	scavenged	yes*
06/16/2022	silver-haired bat	45	36	carcass search	70-m uncleared plots	scavenged	yes*
06/16/2022	silver-haired bat	41	40	carcass search	70-m uncleared plots	scavenged	yes*
06/17/2022	eastern red bat	14	49	carcass search	70-m uncleared plots	scavenged	yes*
06/17/2022	silver-haired bat	37	49	carcass search	70-m uncleared plots	scavenged	yes*
06/20/2022	eastern red bat	63	14	carcass search	70-m cleared plots	scavenged	yes*
06/20/2022	eastern red bat	47	18	carcass search	70-m uncleared plots	scavenged	yes*
06/21/2022	eastern red bat	6	19	carcass search	70-m cleared plots	intact	yes*
06/21/2022	silver-haired bat	63	19	carcass search	70-m cleared plots	scavenged	yes*
06/23/2022	big brown bat	59	26	carcass search	70-m cleared plots	feather spot	yes*
06/23/2022	eastern red bat	70	50	carcass search**	100-m road and pads	scavenged	no
06/23/2022	eastern red bat	18	50	carcass search	100-m road and pads	intact	no
06/23/2022	evening bat	72	33	carcass search**	70-m cleared plots	scavenged	yes*
06/24/2022	eastern red bat	15	37	carcass search	70-m cleared plots	scavenged	yes*
06/24/2022	hoary bat	26	44	carcass search	70-m cleared plots	scavenged	yes*
06/27/2022	eastern red bat	26	11	carcass search	70-m cleared plots	scavenged	yes*
06/27/2022	eastern red bat	44	11	carcass search	70-m cleared plots	scavenged	yes*
06/30/2022	eastern red bat	17	33	carcass search	70-m cleared plots	scavenged	yes*
07/01/2022	hoary bat	49	44	carcass search	70-m cleared plots	scavenged	yes*
07/06/2022	silver-haired bat	59	27	carcass search	70-m uncleared plots	scavenged	yes*
07/06/2022	eastern red bat	11	20	carcass search	100-m road and pads	scavenged	no
07/06/2022	eastern red bat	44	27	carcass search	70-m uncleared plots	scavenged	yes*
07/07/2022	big brown bat	19	19	carcass search	70-m cleared plots	scavenged	yes*
07/07/2022	eastern red bat	59	19	carcass search	70-m cleared plots	scavenged	yes*
07/07/2022	eastern red bat	50	40	carcass search	70-m uncleared plots	scavenged	yes*

Appendix A. Carcasses found at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Found Date	Species	Distance from Turbine	Turbine	Search Type	Search Area Type	Physical Condition	Aided Search
07/07/2022	hoary bat	38	42	carcass search	100-m road and pads	scavenged	no
07/08/2022	big brown bat	32	39	carcass search	70-m uncleared plots	scavenged	yes*
07/11/2022	big brown bat	24	18	carcass search	70-m uncleared plots	scavenged	yes*
07/11/2022	hoary bat	38	11	carcass search	70-m cleared plots	scavenged	yes*
07/12/2022	eastern red bat	36	35	carcass search	70-m uncleared plots	scavenged	yes*
07/13/2022	hoary bat	3	43	carcass search	100-m road and pads	scavenged	no
07/14/2022	eastern red bat	15	39	carcass search	70-m uncleared plots	scavenged	yes*
07/18/2022	eastern red bat	44	14	carcass search	70-m cleared plots	feather spot	yes*
07/21/2022	hoary bat	46	33	carcass search	70-m cleared plots	scavenged	yes*
07/26/2022	hoary bat	21	18	carcass search	70-m uncleared plots	scavenged	yes*
07/28/2022	big brown bat	24	40	carcass search	70-m uncleared plots	feather spot	yes*
07/28/2022	big brown bat	6	51	carcass search	100-m road and pads	intact	no
07/28/2022	eastern red bat	57	33	carcass search	70-m cleared plots	scavenged	yes*
07/28/2022	hoary bat	15	36	carcass search	70-m uncleared plots	scavenged	yes*
07/29/2022	big brown bat	8	46	carcass search	100-m road and pads	injured	no
07/29/2022	hoary bat	24	39	carcass search	70-m uncleared plots	scavenged	yes*
07/29/2022	hoary bat	32	49	carcass search	70-m uncleared plots	scavenged	yes*
08/01/2022	big brown bat	11	2	carcass search	100-m road and pads	scavenged	no
08/01/2022	big brown bat	26	27	carcass search	70-m uncleared plots	scavenged	yes*
08/01/2022	big brown bat	21	45	carcass search**	100-m road and pads	scavenged	no
08/01/2022	big brown bat	0	45	carcass search	100-m road and pads	scavenged	no
08/01/2022	hoary bat	21	18	carcass search	70-m uncleared plots	scavenged	yes*
08/01/2022	hoary bat	8	9	carcass search	100-m road and pads	scavenged	no
08/02/2022	big brown bat	2	15	carcass search	100-m road and pads	scavenged	no
08/02/2022	big brown bat	25	16	incidental	100-m road and pads	scavenged	no
08/02/2022	big brown bat	3	16	incidental	100-m road and pads	scavenged	no
08/02/2022	big brown bat	11	16	carcass search	100-m road and pads	scavenged	no
08/02/2022	big brown bat	3	16	carcass search	100-m road and pads	scavenged	no
08/02/2022	big brown bat	31	37	carcass search	70-m cleared plots	scavenged	yes*
08/02/2022	big brown bat	36	40	carcass search	70-m uncleared plots	scavenged	yes*
08/02/2022	big brown bat	65	49	carcass search	70-m uncleared plots	scavenged	yes*
08/02/2022	eastern red bat	1	12	carcass search	100-m road and pads	scavenged	no
08/02/2022	eastern red bat	11	12	carcass search**	100-m road and pads	scavenged	no
08/02/2022	eastern red bat	2	16	incidental	100-m road and pads	scavenged	no
08/02/2022	eastern red bat	6	26	carcass search	70-m cleared plots	scavenged	yes*
08/02/2022	eastern red bat	14	36	carcass search	70-m uncleared plots	scavenged	yes*
08/02/2022	eastern red bat	33	37	carcass search	70-m cleared plots	scavenged	yes*

Appendix A. Carcasses found at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Found Date	Species	Distance from Turbine	Turbine	Search Type	Search Area Type	Physical Condition	Aided Search
08/02/2022	eastern red bat	50	40	carcass search	70-m uncleared plots	scavenged	yes*
08/02/2022	big brown bat	26	39	carcass search	70-m uncleared plots	scavenged	yes*
08/04/2022	big brown bat	34	50	carcass search	100-m road and pads	intact	no
08/04/2022	big brown bat	15	6	incidental**	100-m road and pads	scavenged	no
08/04/2022	big brown bat	23	6	incidental**	100-m road and pads	scavenged	no
08/04/2022	big brown bat	11	8	carcass search	100-m road and pads	scavenged	no
08/04/2022	eastern red bat	58	11	carcass search	70-m cleared plots	scavenged	yes*
08/04/2022	eastern red bat	8	11	carcass search	70-m cleared plots	scavenged	yes*
08/04/2022	eastern red bat	42	19	carcass search	70-m cleared plots	scavenged	yes*
08/04/2022	eastern red bat	26	19	carcass search	70-m cleared plots	scavenged	yes*
08/04/2022	eastern red bat	44	6	carcass search**	100-m road and pads	scavenged	no
08/04/2022	hoary bat	12	10	carcass search**	100-m road and pads	scavenged	no
08/04/2022	hoary bat	51	6	incidental**	100-m road and pads	scavenged	no
08/05/2022	big brown bat	6	16	carcass search	100-m road and pads	intact	no
08/05/2022	big brown bat	65	37	carcass search	70-m cleared plots	scavenged	yes*
08/05/2022	big brown bat	9	44	carcass search	70-m cleared plots	scavenged	yes*
08/05/2022	eastern red bat	8	24	carcass search	100-m road and pads	scavenged	no
08/05/2022	eastern red bat	43	39	carcass search	70-m uncleared plots	intact	yes*
08/05/2022	eastern red bat	20	49	carcass search	70-m uncleared plots	scavenged	yes*
08/05/2022	hoary bat	44	33	carcass search	70-m cleared plots	scavenged	yes*
08/05/2022	hoary bat	9	49	carcass search	70-m uncleared plots	scavenged	yes*
08/08/2022	big brown bat	37	1	carcass search**	100-m road and pads	intact	no
08/08/2022	big brown bat	30	14	carcass search	70-m cleared plots	intact	yes*
08/08/2022	big brown bat	32	19	incidental	70-m cleared plots	scavenged	yes*
08/08/2022	big brown bat	23	19	carcass search	70-m cleared plots	scavenged	yes*
08/08/2022	big brown bat	29	28	carcass search	70-m cleared plots	scavenged	yes*
08/08/2022	big brown bat	67	28	carcass search	70-m cleared plots	scavenged	yes*
08/08/2022	big brown bat	4	50	carcass search	100-m road and pads	scavenged	no
08/08/2022	eastern red bat	17	11	carcass search	70-m cleared plots	intact	yes*
08/08/2022	eastern red bat	30	11	carcass search	70-m cleared plots	scavenged	yes*
08/08/2022	eastern red bat	42	19	carcass search	70-m cleared plots	scavenged	yes*
08/08/2022	eastern red bat	29	19	carcass search	70-m cleared plots	scavenged	yes*
08/08/2022	eastern red bat	44	19	carcass search	70-m cleared plots	scavenged	yes*
08/08/2022	eastern red bat	8	3	carcass search	100-m road and pads	scavenged	no
08/08/2022	eastern red bat	6	6	carcass search	100-m road and pads	scavenged	no
08/08/2022	Seminole bat	2	3	carcass search	100-m road and pads	scavenged	no
08/09/2022	big brown bat	8	15	carcass search	100-m road and pads	scavenged	no

Appendix A. Carcasses found at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Found Date	Species	Distance from Turbine	Turbine	Search Type	Search Area Type	Physical Condition	Aided Search
08/09/2022	big brown bat	5	24	carcass search	100-m road and pads	scavenged	no
08/09/2022	big brown bat	23	33	carcass search	70-m cleared plots	scavenged	yes*
08/09/2022	big brown bat	9	35	carcass search	70-m uncleared plots	scavenged	yes*
08/09/2022	big brown bat	41	37	carcass search	70-m cleared plots	scavenged	yes*
08/09/2022	big brown bat	32	49	carcass search	70-m uncleared plots	scavenged	yes*
08/09/2022	eastern red bat	35	35	carcass search	70-m uncleared plots	scavenged	yes*
08/09/2022	eastern red bat	34	36	carcass search	70-m uncleared plots	scavenged	yes*
08/09/2022	eastern red bat	63	36	carcass search	70-m uncleared plots	scavenged	yes*
08/09/2022	eastern red bat	42	37	carcass search	70-m cleared plots	scavenged	yes*
08/09/2022	eastern red bat	24	37	carcass search	70-m cleared plots	scavenged	yes*
08/09/2022	eastern red bat	62	40	carcass search	70-m uncleared plots	scavenged	yes*
08/09/2022	eastern red bat	12	49	carcass search	70-m uncleared plots	scavenged	yes*
08/09/2022	hoary bat	41	37	carcass search	70-m cleared plots	scavenged	yes*
08/09/2022	hoary bat	14	37	carcass search	70-m cleared plots	scavenged	yes*
08/10/2022	big brown bat	41	44	carcass search	70-m cleared plots	scavenged	yes*
08/10/2022	big brown bat	31	44	carcass search	70-m cleared plots	scavenged	yes*
08/10/2022	hoary bat	44	44	carcass search	70-m cleared plots	scavenged	yes*
08/11/2022	big brown bat	14	19	carcass search	70-m cleared plots	scavenged	yes*
08/11/2022	big brown bat	35	27	carcass search	70-m uncleared plots	scavenged	yes*
08/11/2022	eastern red bat	35	14	carcass search	70-m cleared plots	scavenged	yes*
08/11/2022	eastern red bat	17	19	carcass search	70-m cleared plots	scavenged	yes*
08/11/2022	eastern red bat	63	35	carcass search	70-m uncleared plots	scavenged	yes*
08/11/2022	hoary bat	14	27	carcass search	70-m uncleared plots	scavenged	yes*
08/12/2022	big brown bat	0	29	incidental	100-m road and pads	intact	no
08/12/2022	big brown bat	35	39	carcass search	70-m uncleared plots	scavenged	yes*
08/12/2022	big brown bat	50	49	carcass search	70-m uncleared plots	scavenged	yes*
08/12/2022	eastern red bat	5	16	carcass search	100-m road and pads	intact	no
08/12/2022	eastern red bat	15	26	carcass search	70-m cleared plots	scavenged	yes*
08/12/2022	eastern red bat	15	29	carcass search	100-m road and pads	intact	no
08/12/2022	eastern red bat	5	38	carcass search	100-m road and pads	scavenged	no
08/12/2022	eastern red bat	43	44	carcass search	70-m cleared plots	intact	yes*
08/12/2022	Seminole bat	8	17	carcass search	100-m road and pads	intact	no
08/12/2022	Seminole bat	29	29	carcass search	100-m road and pads	intact	no
08/15/2022	big brown bat	35	19	carcass search	70-m cleared plots	scavenged	yes*
08/15/2022	big brown bat	43	19	carcass search	70-m cleared plots	scavenged	yes*
08/15/2022	big brown bat	3	52	carcass search	100-m road and pads	scavenged	no
08/15/2022	eastern red bat	28	11	carcass search	70-m cleared plots	intact	yes*

Appendix A. Carcasses found at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Found Date	Species	Distance from Turbine	Turbine	Search Type	Search Area Type	Physical Condition	Aided Search
08/15/2022	eastern red bat	24	19	carcass search	70-m cleared plots	scavenged	yes*
08/15/2022	eastern red bat	12	19	carcass search	70-m cleared plots	scavenged	yes*
08/15/2022	eastern red bat	40	19	carcass search	70-m cleared plots	scavenged	yes*
08/15/2022	eastern red bat	56	27	carcass search	70-m uncleared plots	scavenged	yes*
08/15/2022	eastern red bat	2	47	carcass search	100-m road and pads	scavenged	no
08/15/2022	hoary bat	45	11	carcass search	70-m cleared plots	scavenged	yes*
08/15/2022	hoary bat	40	11	carcass search	70-m cleared plots	scavenged	yes*
08/15/2022	hoary bat	9	2	carcass search**	100-m road and pads	scavenged	no
08/16/2022	big brown bat	47	36	carcass search	70-m uncleared plots	scavenged	yes*
08/16/2022	big brown bat	33	44	carcass search	70-m cleared plots	scavenged	yes*
08/16/2022	eastern red bat	64	26	carcass search	70-m cleared plots	scavenged	yes*
08/16/2022	eastern red bat	35	39	carcass search	70-m uncleared plots	scavenged	yes*
08/16/2022	hoary bat	40	26	carcass search	70-m cleared plots	feather spot	yes*
08/16/2022	hoary bat	23	33	carcass search	70-m cleared plots	scavenged	yes*
08/16/2022	hoary bat	56	39	carcass search	70-m uncleared plots	scavenged	yes*
08/16/2022	hoary bat	15	40	carcass search	70-m uncleared plots	scavenged	yes*
08/16/2022	hoary bat	32	49	carcass search	70-m uncleared plots	scavenged	yes*
08/17/2022	big brown bat	5	16	carcass search	100-m road and pads	intact	no
08/17/2022	eastern red bat	38	35	carcass search	70-m uncleared plots	intact	yes*
08/17/2022	eastern red bat	6	45	carcass search	100-m road and pads	scavenged	no
08/17/2022	hoary bat	43	35	carcass search	70-m uncleared plots	scavenged	yes*
08/18/2022	big brown bat	26	14	carcass search	70-m cleared plots	scavenged	yes*
08/18/2022	big brown bat	29	49	carcass search	70-m uncleared plots	injured	yes*
08/18/2022	eastern red bat	9	21	carcass search	70-m uncleared plots	scavenged	yes*
08/18/2022	eastern red bat	43	37	carcass search	70-m cleared plots	scavenged	yes*
08/18/2022	eastern red bat	35	49	carcass search	70-m uncleared plots	scavenged	yes*
08/18/2022	hoary bat	36	49	carcass search	70-m uncleared plots	scavenged	yes*
08/19/2022	big brown bat	30	40	carcass search	70-m uncleared plots	scavenged	yes*
08/19/2022	big brown bat	53	40	carcass search	70-m uncleared plots	scavenged	yes*
08/19/2022	eastern red bat	5	15	carcass search	100-m road and pads	scavenged	no
08/19/2022	eastern red bat	5	16	carcass search	100-m road and pads	scavenged	no
08/19/2022	eastern red bat	26	26	carcass search	70-m cleared plots	scavenged	yes*
08/19/2022	eastern red bat	18	26	carcass search	70-m cleared plots	scavenged	yes*
08/19/2022	eastern red bat	30	44	carcass search	70-m cleared plots	scavenged	yes*
08/22/2022	big brown bat	19	14	carcass search	70-m cleared plots	intact	yes*
08/22/2022	big brown bat	45	14	carcass search	70-m cleared plots	scavenged	yes*
08/22/2022	big brown bat	50	19	carcass search	70-m cleared plots	scavenged	yes*

Appendix A. Carcasses found at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Found Date	Species	Distance from Turbine	Turbine	Search Type	Search Area Type	Physical Condition	Aided Search
08/22/2022	big brown bat	33	19	carcass search	70-m cleared plots	scavenged	yes*
08/22/2022	big brown bat	65	19	carcass search	70-m cleared plots	scavenged	yes*
08/22/2022	big brown bat	45	19	carcass search	70-m cleared plots	scavenged	yes*
08/22/2022	eastern red bat	8	18	carcass search	70-m uncleared plots	scavenged	yes*
08/22/2022	eastern red bat	13	21	carcass search	70-m uncleared plots	scavenged	yes*
08/22/2022	eastern red bat	17	28	carcass search	70-m cleared plots	scavenged	yes*
08/22/2022	eastern red bat	69	28	carcass search**	70-m cleared plots	scavenged	yes*
08/22/2022	eastern red bat	10	4	carcass search	100-m road and pads	intact	no
08/22/2022	eastern red bat	0	51	carcass search	100-m road and pads	scavenged	no
08/22/2022	eastern red bat	7	51	carcass search	100-m road and pads	scavenged	no
08/22/2022	silver-haired bat	45	28	carcass search	70-m cleared plots	scavenged	yes*
08/23/2022	big brown bat	3	15	carcass search	100-m road and pads	scavenged	no
08/23/2022	big brown bat	41	32	carcass search	100-m road and pads	scavenged	no
08/23/2022	big brown bat	26	36	carcass search	70-m uncleared plots	scavenged	yes*
08/23/2022	eastern red bat	10	15	carcass search**	100-m road and pads	scavenged	no
08/23/2022	eastern red bat	19	23	carcass search	100-m road and pads	scavenged	no
08/23/2022	eastern red bat	26	30	carcass search	100-m road and pads	scavenged	no
08/23/2022	eastern red bat	26	33	carcass search	70-m cleared plots	scavenged	yes*
08/23/2022	eastern red bat	43	36	carcass search	70-m uncleared plots	scavenged	yes*
08/23/2022	eastern red bat	46	36	carcass search	70-m uncleared plots	scavenged	yes*
08/23/2022	hoary bat	35	26	carcass search	70-m cleared plots	scavenged	yes*
08/23/2022	hoary bat	17	30	carcass search	100-m road and pads	scavenged	no
08/24/2022	big brown bat	6	16	carcass search	100-m road and pads	scavenged	no
08/24/2022	big brown bat	40	37	carcass search	70-m cleared plots	intact	yes*
08/24/2022	big brown bat	9	39	carcass search	70-m uncleared plots	feather spot	yes*
08/24/2022	eastern red bat	5	22	carcass search	100-m road and pads	scavenged	no
08/24/2022	eastern red bat	18	37	carcass search	70-m cleared plots	intact	yes*
08/24/2022	eastern red bat	60	37	carcass search	70-m cleared plots	intact	yes*
08/24/2022	eastern red bat	12	39	carcass search	70-m uncleared plots	scavenged	yes*
08/24/2022	eastern red bat	9	44	carcass search	70-m cleared plots	feather spot	yes*
08/24/2022	eastern red bat	24	49	carcass search	70-m uncleared plots	scavenged	yes*
08/24/2022	Seminole bat	11	20	carcass search	100-m road and pads	scavenged	no
08/25/2022	big brown bat	15	11	carcass search	70-m cleared plots	scavenged	yes*
08/25/2022	big brown bat	3	11	carcass search	70-m cleared plots	scavenged	yes*
08/25/2022	big brown bat	47	18	carcass search	70-m uncleared plots	scavenged	yes*
08/25/2022	big brown bat	49	19	carcass search	70-m cleared plots	dismembered	yes*
08/25/2022	big brown bat	6	2	carcass search	100-m road and pads	scavenged	no

Appendix A. Carcasses found at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Found Date	Species	Distance from Turbine	Turbine	Search Type	Search Area Type	Physical Condition	Aided Search
08/25/2022	hoary bat	3	37	incidental	70-m cleared plots	scavenged	yes*
08/26/2022	big brown bat	5	30	carcass search	100-m road and pads	scavenged	no
08/26/2022	big brown bat	28	44	carcass search	70-m cleared plots	scavenged	yes*
08/26/2022	eastern red bat	30	26	carcass search	70-m cleared plots	scavenged	yes*
08/26/2022	eastern red bat	54	26	carcass search	70-m cleared plots	intact	yes*
08/26/2022	eastern red bat	62	33	carcass search	70-m cleared plots	scavenged	yes*
08/26/2022	eastern red bat	60	33	carcass search	70-m cleared plots	scavenged	yes*
08/26/2022	eastern red bat	33	44	carcass search	70-m cleared plots	scavenged	yes*
08/26/2022	eastern red bat	26	44	carcass search	70-m cleared plots	scavenged	yes*
08/26/2022	eastern red bat	40	44	carcass search	70-m cleared plots	scavenged	yes*
08/26/2022	evening bat	30	49	carcass search	70-m uncleared plots	scavenged	yes*
08/26/2022	hoary bat	24	44	carcass search	70-m cleared plots	intact	yes*
08/26/2022	Seminole bat	45	37	carcass search	70-m cleared plots	scavenged	yes*
08/26/2022	silver-haired bat	3	25	carcass search	100-m road and pads	feather spot	no
08/29/2022	big brown bat	41	11	carcass search	70-m cleared plots	scavenged	yes*
08/29/2022	big brown bat	26	19	carcass search	70-m cleared plots	scavenged	yes*
08/29/2022	big brown bat	6	19	carcass search	70-m cleared plots	scavenged	yes*
08/29/2022	big brown bat	24	19	carcass search	70-m cleared plots	scavenged	yes*
08/29/2022	big brown bat	11	52	carcass search	100-m road and pads	scavenged	no
08/29/2022	eastern red bat	0	10	carcass search	100-m road and pads	scavenged	no
08/29/2022	eastern red bat	39	11	carcass search	70-m cleared plots	scavenged	yes*
08/29/2022	eastern red bat	32	14	carcass search	70-m cleared plots	scavenged	yes*
08/29/2022	eastern red bat	17	18	carcass search	70-m uncleared plots	scavenged	yes*
08/29/2022	eastern red bat	44	18	carcass search	70-m uncleared plots	scavenged	yes*
08/29/2022	eastern red bat	20	18	carcass search	70-m uncleared plots	scavenged	yes*
08/29/2022	eastern red bat	43	18	carcass search	70-m uncleared plots	scavenged	yes*
08/29/2022	eastern red bat	28	18	carcass search	70-m uncleared plots	scavenged	yes*
08/29/2022	hoary bat	52	14	carcass search	70-m cleared plots	intact	yes*
08/29/2022	hoary bat	47	14	carcass search	70-m cleared plots	feather spot	yes*
08/29/2022	hoary bat	28	42	carcass search	100-m road and pads	scavenged	no
08/29/2022	silver-haired bat	34	28	carcass search	70-m cleared plots	scavenged	yes*
08/30/2022	big brown bat	12	13	carcass search	100-m road and pads	scavenged	no
08/30/2022	big brown bat	60	49	carcass search	70-m uncleared plots	scavenged	yes*
08/30/2022	eastern red bat	11	21	carcass search	70-m uncleared plots	scavenged	yes*
08/30/2022	eastern red bat	9	22	carcass search	100-m road and pads	scavenged	no
08/30/2022	eastern red bat	44	26	carcass search	70-m cleared plots	scavenged	yes*
08/30/2022	eastern red bat	43	26	carcass search	70-m cleared plots	scavenged	yes*

Appendix A. Carcasses found at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Found Date	Species	Distance from Turbine	Turbine	Search Type	Search Area Type	Physical Condition	Aided Search
08/30/2022	eastern red bat	30	33	carcass search	70-m cleared plots	scavenged	yes*
08/30/2022	eastern red bat	39	33	carcass search	70-m cleared plots	scavenged	yes*
08/30/2022	eastern red bat	6	33	carcass search	70-m cleared plots	scavenged	yes*
08/30/2022	eastern red bat	18	36	carcass search	70-m uncleared plots	scavenged	yes*
08/30/2022	eastern red bat	33	36	carcass search	70-m uncleared plots	scavenged	yes*
08/30/2022	eastern red bat	43	37	carcass search	70-m cleared plots	scavenged	yes*
08/30/2022	eastern red bat	15	37	carcass search	70-m cleared plots	scavenged	yes*
08/30/2022	Indiana bat	9	17	carcass search	100-m road and pads	scavenged	no
08/30/2022	silver-haired bat	7	12	carcass search	100-m road and pads	scavenged	no
08/30/2022	silver-haired bat	32	37	carcass search	70-m cleared plots	scavenged	yes*
08/30/2022	silver-haired bat	41	49	carcass search	70-m uncleared plots	scavenged	yes*
08/30/2022	silver-haired bat	44	49	carcass search	70-m uncleared plots	scavenged	yes*
09/01/2022	big brown bat	2	10	carcass search	100-m road and pads	scavenged	no
09/01/2022	big brown bat	41	14	carcass search	70-m cleared plots	scavenged	yes*
09/01/2022	big brown bat	26	18	carcass search	70-m uncleared plots	scavenged	yes*
09/01/2022	eastern red bat	50	11	carcass search	70-m cleared plots	injured	yes*
09/01/2022	eastern red bat	53	11	carcass search	70-m cleared plots	scavenged	yes*
09/01/2022	eastern red bat	23	11	carcass search	70-m cleared plots	scavenged	yes*
09/01/2022	eastern red bat	47	18	carcass search	70-m uncleared plots	scavenged	yes*
09/01/2022	eastern red bat	63	18	carcass search	70-m uncleared plots	dismembered	yes*
09/01/2022	eastern red bat	29	19	carcass search	70-m cleared plots	scavenged	yes*
09/01/2022	eastern red bat	14	28	carcass search	70-m cleared plots	scavenged	yes*
09/01/2022	eastern red bat	47	35	carcass search	70-m uncleared plots	scavenged	yes*
09/01/2022	eastern red bat	8	5	carcass search	100-m road and pads	scavenged	no
09/01/2022	eastern red bat	8	50	carcass search	100-m road and pads	scavenged	no
09/01/2022	hoary bat	43	11	carcass search	70-m cleared plots	scavenged	yes*
09/01/2022	hoary bat	12	11	carcass search	70-m cleared plots	intact	yes*
09/01/2022	silver-haired bat	7	10	carcass search	100-m road and pads	scavenged	no
09/01/2022	silver-haired bat	56	11	carcass search	70-m cleared plots	scavenged	yes*
09/01/2022	silver-haired bat	58	14	carcass search	70-m cleared plots	scavenged	yes*
09/01/2022	silver-haired bat	12	18	carcass search	70-m uncleared plots	scavenged	yes*
09/01/2022	silver-haired bat	29	28	carcass search	70-m cleared plots	intact	yes*
09/01/2022	silver-haired bat	36	28	carcass search	70-m cleared plots	scavenged	yes*
09/01/2022	silver-haired bat	50	3	carcass search	100-m road and pads	scavenged	no
09/01/2022	silver-haired bat	4	4	carcass search	100-m road and pads	scavenged	no
09/01/2022	silver-haired bat	8	46	carcass search	100-m road and pads	intact	no
09/01/2022	silver-haired bat	11	5	carcass search**	100-m road and pads	scavenged	no

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Found Date	Species	Distance from Turbine	Turbine	Search Type	Search Area Type	Physical Condition	Aided Search
09/01/2022	silver-haired bat	3	52	carcass search	100-m road and pads	intact	no
09/01/2022	silver-haired bat	80	9	carcass search	100-m road and pads	scavenged	no
09/02/2022	big brown bat	9	24	carcass search	100-m road and pads	scavenged	no
09/02/2022	big brown bat	16	33	carcass search	70-m cleared plots	scavenged	yes*
09/02/2022	big brown bat	9	36	carcass search	70-m uncleared plots	scavenged	yes*
09/02/2022	big brown bat	1	37	carcass search	70-m cleared plots	scavenged	yes*
09/02/2022	big brown bat	40	40	carcass search	70-m uncleared plots	scavenged	yes*
09/02/2022	big brown bat	40	44	carcass search	70-m cleared plots	dismembered	yes*
09/02/2022	big brown bat	44	44	carcass search	70-m cleared plots	dismembered	yes*
09/02/2022	big brown bat	60	44	carcass search	70-m cleared plots	feather spot	yes*
09/02/2022	big brown bat	9	7	carcass search	100-m road and pads	scavenged	no
09/02/2022	eastern red bat	23	12	carcass search	100-m road and pads	intact	no
09/02/2022	eastern red bat	3	24	carcass search	100-m road and pads	scavenged	no
09/02/2022	eastern red bat	7	32	carcass search	100-m road and pads	scavenged	no
09/02/2022	eastern red bat	38	44	carcass search	70-m cleared plots	scavenged	yes*
09/02/2022	eastern red bat	10	49	carcass search	70-m uncleared plots	scavenged	yes*
09/02/2022	silver-haired bat	21	12	carcass search	100-m road and pads	intact	no
09/02/2022	silver-haired bat	3	12	carcass search	100-m road and pads	scavenged	no
09/02/2022	silver-haired bat	19	16	carcass search	100-m road and pads	intact	no
09/02/2022	silver-haired bat	41	20	carcass search	100-m road and pads	scavenged	no
09/02/2022	silver-haired bat	35	26	carcass search	70-m cleared plots	scavenged	yes*
09/02/2022	silver-haired bat	9	26	carcass search	70-m cleared plots	scavenged	yes*
09/02/2022	silver-haired bat	65	33	carcass search	70-m cleared plots	scavenged	yes*
09/02/2022	silver-haired bat	41	33	carcass search	70-m cleared plots	scavenged	yes*
09/02/2022	silver-haired bat	14	36	carcass search	70-m uncleared plots	scavenged	yes*
09/02/2022	silver-haired bat	37	44	carcass search	70-m cleared plots	scavenged	yes*
09/02/2022	silver-haired bat	40	44	carcass search	70-m cleared plots	scavenged	yes*
09/02/2022	silver-haired bat	21	44	carcass search	70-m cleared plots	scavenged	yes*
09/02/2022	silver-haired bat	35	49	carcass search	70-m uncleared plots	feather spot	yes*
09/02/2022	silver-haired bat	47	49	carcass search	70-m uncleared plots	scavenged	yes*
09/05/2022	eastern red bat	35	11	carcass search	70-m cleared plots	intact	yes*
09/05/2022	eastern red bat	50	11	carcass search	70-m cleared plots	scavenged	yes*
09/05/2022	eastern red bat	40	14	carcass search	70-m cleared plots	intact	yes*
09/05/2022	eastern red bat	62	14	carcass search	70-m cleared plots	scavenged	yes*
09/05/2022	eastern red bat	38	19	carcass search	70-m cleared plots	scavenged	yes*
09/05/2022	eastern red bat	33	35	carcass search	70-m uncleared plots	scavenged	yes*
09/05/2022	hoary bat	18	14	carcass search	70-m cleared plots	scavenged	yes*

Appendix A. Carcasses found at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Found Date	Species	Distance from Turbine	Turbine	Search Type	Search Area Type	Physical Condition	Aided Search
09/05/2022	silver-haired bat	51	14	carcass search	70-m cleared plots	scavenged	yes*
09/05/2022	silver-haired bat	20	18	carcass search	70-m uncleared plots	scavenged	yes*
09/05/2022	silver-haired bat	45	18	carcass search	70-m uncleared plots	scavenged	yes*
09/05/2022	silver-haired bat	36	18	carcass search	70-m uncleared plots	scavenged	yes*
09/05/2022	silver-haired bat	38	19	carcass search	70-m cleared plots	scavenged	yes*
09/05/2022	silver-haired bat	37	35	carcass search	70-m uncleared plots	scavenged	yes*
09/05/2022	silver-haired bat	25	51	carcass search	100-m road and pads	intact	no
09/05/2022	silver-haired bat	0	52	carcass search	100-m road and pads	injured	no
09/05/2022	silver-haired bat	4	8	carcass search	100-m road and pads	scavenged	no
09/06/2022	big brown bat	5	13	carcass search	100-m road and pads	scavenged	no
09/06/2022	big brown bat	36	37	carcass search	70-m cleared plots	scavenged	yes*
09/06/2022	big brown bat	21	44	carcass search	70-m cleared plots	scavenged	yes*
09/06/2022	eastern red bat	43	40	carcass search	70-m uncleared plots	scavenged	yes*
09/06/2022	eastern red bat	35	49	carcass search	70-m uncleared plots	scavenged	yes*
09/06/2022	hoary bat	35	49	carcass search	70-m uncleared plots	scavenged	yes*
09/06/2022	silver-haired bat	44	26	carcass search	70-m cleared plots	scavenged	yes*
09/06/2022	silver-haired bat	36	37	carcass search	70-m cleared plots	scavenged	yes*
09/06/2022	silver-haired bat	38	44	carcass search	70-m cleared plots	scavenged	yes*
09/06/2022	silver-haired bat	11	49	carcass search	70-m uncleared plots	scavenged	yes*
09/07/2022	eastern red bat	21	33	carcass search	70-m cleared plots	scavenged	yes*
09/07/2022	Seminole bat	33	33	carcass search	70-m cleared plots	scavenged	yes*
09/07/2022	silver-haired bat	32	33	carcass search	70-m cleared plots	scavenged	yes*
09/08/2022	big brown bat	30	19	carcass search	70-m cleared plots	scavenged	yes*
09/08/2022	big brown bat	6	42	carcass search	100-m road and pads	scavenged	no
09/08/2022	eastern red bat	62	14	carcass search	70-m cleared plots	scavenged	yes*
09/08/2022	eastern red bat	43	35	carcass search	70-m uncleared plots	scavenged	yes*
09/08/2022	eastern red bat	14	41	carcass search	100-m road and pads	scavenged	no
09/09/2022	big brown bat	36	44	carcass search	70-m cleared plots	scavenged	yes*
09/09/2022	eastern red bat	50	26	carcass search	70-m cleared plots	scavenged	yes*
09/09/2022	silver-haired bat	47	33	carcass search	70-m cleared plots	scavenged	yes*
09/09/2022	silver-haired bat	8	40	carcass search	70-m uncleared plots	dismembered	yes*
09/09/2022	silver-haired bat	23	40	carcass search	70-m uncleared plots	scavenged	yes*
09/12/2022	big brown bat	9	10	carcass search	100-m road and pads	intact	no
09/12/2022	big brown bat	21	18	carcass search	70-m uncleared plots	intact	yes*
09/12/2022	big brown bat	35	19	carcass search	70-m cleared plots	scavenged	yes*
09/12/2022	eastern red bat	15	2	carcass search	100-m road and pads	intact	no
09/12/2022	eastern red bat	29	21	carcass search	70-m uncleared plots	scavenged	yes*

Appendix A. Carcasses found at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Found Date	Species	Distance from Turbine	Turbine	Search Type	Search Area Type	Physical Condition	Aided Search
09/12/2022	hoary bat	24	14	carcass search	70-m cleared plots	scavenged	yes*
09/12/2022	hoary bat	54	28	carcass search	70-m cleared plots	scavenged	yes*
09/12/2022	hoary bat	8	35	carcass search	70-m uncleared plots	scavenged	yes*
09/12/2022	hoary bat	6	6	carcass search	100-m road and pads	scavenged	no
09/12/2022	silver-haired bat	5	3	carcass search	100-m road and pads	intact	no
09/13/2022	big brown bat	1	30	carcass search	100-m road and pads	intact	no
09/13/2022	eastern red bat	5	15	carcass search	100-m road and pads	scavenged	no
09/13/2022	eastern red bat	20	26	carcass search	70-m cleared plots	scavenged	yes*
09/13/2022	eastern red bat	47	36	carcass search	70-m uncleared plots	scavenged	yes*
09/13/2022	eastern red bat	45	37	carcass search	70-m cleared plots	scavenged	yes*
09/13/2022	eastern red bat	56	37	carcass search	70-m cleared plots	scavenged	yes*
09/13/2022	eastern red bat	33	40	carcass search	70-m uncleared plots	scavenged	yes*
09/13/2022	eastern red bat	21	44	carcass search	70-m cleared plots	scavenged	yes*
09/13/2022	eastern red bat	50	49	carcass search	70-m uncleared plots	scavenged	yes*
09/13/2022	hoary bat	34	17	carcass search	100-m road and pads	scavenged	no
09/13/2022	hoary bat	43	26	carcass search	70-m cleared plots	intact	yes*
09/13/2022	hoary bat	44	37	carcass search	70-m cleared plots	scavenged	yes*
09/13/2022	silver-haired bat	65	33	carcass search	70-m cleared plots	scavenged	yes*
09/13/2022	silver-haired bat	35	33	carcass search	70-m cleared plots	scavenged	yes*
09/13/2022	silver-haired bat	28	33	carcass search	70-m cleared plots	intact	yes*
09/13/2022	silver-haired bat	25	33	carcass search	70-m cleared plots	intact	yes*
09/13/2022	silver-haired bat	36	33	carcass search	70-m cleared plots	scavenged	yes*
09/13/2022	silver-haired bat	57	37	carcass search	70-m cleared plots	scavenged	yes*
09/13/2022	silver-haired bat	26	49	carcass search	70-m uncleared plots	scavenged	yes*
09/15/2022	big brown bat	52	19	carcass search	70-m cleared plots	scavenged	yes*
09/15/2022	eastern red bat	47	14	carcass search	70-m cleared plots	scavenged	yes*
09/15/2022	eastern red bat	52	19	carcass search	70-m cleared plots	scavenged	yes*
09/15/2022	silver-haired bat	39	21	carcass search	70-m uncleared plots	scavenged	yes*
09/15/2022	silver-haired bat	33	35	carcass search	70-m uncleared plots	scavenged	yes*
09/15/2022	silver-haired bat	17	51	carcass search	100-m road and pads	scavenged	no
09/15/2022	silver-haired bat	33	6	carcass search	100-m road and pads	scavenged	no
09/16/2022	eastern red bat	44	40	carcass search	70-m uncleared plots	scavenged	yes*
09/16/2022	hoary bat	43	36	carcass search	70-m uncleared plots	scavenged	yes*
09/16/2022	hoary bat	37	37	carcass search	70-m cleared plots	scavenged	yes*
09/16/2022	silver-haired bat	9	24	carcass search**	100-m road and pads	scavenged	no
09/16/2022	silver-haired bat	9	25	carcass search	100-m road and pads	intact	no
09/16/2022	silver-haired bat	33	26	carcass search	70-m cleared plots	scavenged	yes*

Appendix A. Carcasses found at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Found Date	Species	Distance from Turbine	Turbine	Search Type	Search Area Type	Physical Condition	Aided Search
09/16/2022	silver-haired bat	15	26	carcass search	70-m cleared plots	scavenged	yes*
09/16/2022	silver-haired bat	29	33	carcass search	70-m cleared plots	intact	yes*
09/16/2022	silver-haired bat	37	33	carcass search	70-m cleared plots	scavenged	yes*
09/16/2022	silver-haired bat	48	44	carcass search	70-m cleared plots	scavenged	yes*
09/16/2022	silver-haired bat	41	49	carcass search	70-m uncleared plots	scavenged	yes*
09/19/2022	big brown bat	8	51	carcass search	100-m road and pads	scavenged	no
09/19/2022	eastern red bat	8	28	carcass search	70-m cleared plots	scavenged	yes*
09/19/2022	eastern red bat	9	8	carcass search**	100-m road and pads	scavenged	no
09/19/2022	silver-haired bat	11	10	carcass search	100-m road and pads	scavenged	no
09/19/2022	silver-haired bat	29	11	carcass search	70-m cleared plots	feather spot	yes*
09/19/2022	silver-haired bat	43	14	carcass search	70-m cleared plots	scavenged	yes*
09/19/2022	silver-haired bat	23	18	carcass search	70-m uncleared plots	scavenged	yes*
09/19/2022	silver-haired bat	31	19	carcass search	70-m cleared plots	scavenged	yes*
09/19/2022	silver-haired bat	40	19	carcass search	70-m cleared plots	scavenged	yes*
09/19/2022	silver-haired bat	55	19	carcass search	70-m cleared plots	scavenged	yes*
09/19/2022	silver-haired bat	34	19	carcass search	70-m cleared plots	scavenged	yes*
09/19/2022	silver-haired bat	30	19	carcass search	70-m cleared plots	scavenged	yes*
09/19/2022	silver-haired bat	56	28	carcass search	70-m cleared plots	dismembered	yes*
09/19/2022	silver-haired bat	32	35	carcass search	70-m uncleared plots	scavenged	yes*
09/19/2022	silver-haired bat	35	49	carcass search	70-m uncleared plots	scavenged	yes*
09/19/2022	silver-haired bat	5	50	carcass search	100-m road and pads	scavenged	no
09/19/2022	silver-haired bat	0	52	carcass search	100-m road and pads	scavenged	no
09/19/2022	silver-haired bat	6	6	carcass search	100-m road and pads	scavenged	no
09/20/2022	eastern red bat	43	37	carcass search	70-m cleared plots	scavenged	yes*
09/20/2022	eastern red bat	35	37	carcass search	70-m cleared plots	scavenged	yes*
09/20/2022	silver-haired bat	8	20	carcass search	100-m road and pads	scavenged	no
09/20/2022	silver-haired bat	40	26	carcass search	70-m cleared plots	scavenged	yes*
09/20/2022	silver-haired bat	37	37	carcass search	70-m cleared plots	scavenged	yes*
09/20/2022	silver-haired bat	58	39	carcass search	70-m uncleared plots	scavenged	yes*
09/20/2022	silver-haired bat	39	40	carcass search	70-m uncleared plots	scavenged	yes*
09/20/2022	silver-haired bat	53	44	carcass search	70-m cleared plots	scavenged	yes*
09/22/2022	big brown bat	27	5	carcass search	100-m road and pads	scavenged	no
09/22/2022	eastern red bat	23	11	carcass search	70-m cleared plots	scavenged	yes*
09/22/2022	eastern red bat	44	14	carcass search	70-m cleared plots	intact	yes*
09/22/2022	eastern red bat	51	19	carcass search	70-m cleared plots	scavenged	yes*
09/22/2022	eastern red bat	14	19	carcass search	70-m cleared plots	scavenged	yes*
09/22/2022	hoary bat	11	47	carcass search**	100-m road and pads	scavenged	no

Appendix A. Carcasses found at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Found Date	Species	Distance from Turbine	Turbine	Search Type	Search Area Type	Physical Condition	Aided Search
09/22/2022	silver-haired bat	36	11	carcass search	70-m cleared plots	scavenged	yes*
09/22/2022	silver-haired bat	63	14	carcass search	70-m cleared plots	scavenged	yes*
09/22/2022	silver-haired bat	65	19	carcass search	70-m cleared plots	scavenged	yes*
09/22/2022	silver-haired bat	30	19	carcass search	70-m cleared plots	scavenged	yes*
09/22/2022	silver-haired bat	6	50	carcass search	100-m road and pads	scavenged	no
09/22/2022	silver-haired bat	7	6	carcass search	100-m road and pads	scavenged	no
09/23/2022	big brown bat	9	12	carcass search	100-m road and pads	intact	no
09/23/2022	big brown bat	6	31	carcass search	100-m road and pads	scavenged	no
09/23/2022	big brown bat	17	39	carcass search	70-m uncleared plots	intact	yes*
09/23/2022	eastern red bat	8	38	carcass search	100-m road and pads	intact	no
09/23/2022	silver-haired bat	40	39	carcass search	70-m uncleared plots	intact	yes*
09/26/2022	big brown bat	23	35	carcass search	70-m uncleared plots	scavenged	yes*
09/26/2022	eastern red bat	48	11	carcass search	70-m cleared plots	scavenged	yes*
09/26/2022	eastern red bat	30	21	carcass search**	70-m uncleared plots	scavenged	yes*
09/26/2022	Seminole bat	9	4	carcass search**	100-m road and pads	scavenged	no
09/26/2022	silver-haired bat	0	11	carcass search	70-m cleared plots	intact	yes*
09/26/2022	silver-haired bat	65	11	carcass search	70-m cleared plots	scavenged	yes*
09/26/2022	silver-haired bat	47	11	carcass search	70-m cleared plots	intact	yes*
09/26/2022	silver-haired bat	62	11	carcass search	70-m cleared plots	intact	yes*
09/26/2022	silver-haired bat	35	14	carcass search	70-m cleared plots	intact	yes*
09/26/2022	silver-haired bat	37	19	carcass search	70-m cleared plots	scavenged	yes*
09/26/2022	silver-haired bat	44	19	carcass search	70-m cleared plots	scavenged	yes*
09/26/2022	silver-haired bat	52	19	carcass search	70-m cleared plots	scavenged	yes*
09/26/2022	silver-haired bat	57	28	carcass search	70-m cleared plots	scavenged	yes*
09/26/2022	silver-haired bat	32	28	carcass search	70-m cleared plots	scavenged	yes*
09/26/2022	silver-haired bat	11	35	carcass search	70-m uncleared plots	scavenged	yes*
09/26/2022	silver-haired bat	6	35	carcass search	70-m uncleared plots	scavenged	yes*
09/26/2022	silver-haired bat	26	42	carcass search	100-m road and pads	scavenged	no
09/27/2022	big brown bat	45	44	carcass search	70-m cleared plots	dismembered	yes*
09/27/2022	big brown bat	44	44	carcass search	70-m cleared plots	scavenged	yes*
09/27/2022	eastern red bat	60	26	carcass search	70-m cleared plots	scavenged	yes*
09/27/2022	hoary bat	17	36	carcass search	70-m uncleared plots	intact	yes*
09/27/2022	silver-haired bat	6	39	carcass search	70-m uncleared plots	dismembered	yes*
09/30/2022	eastern red bat	41	36	carcass search	70-m uncleared plots	scavenged	yes*
09/30/2022	silver-haired bat	44	49	carcass search	70-m uncleared plots	scavenged	yes*
10/03/2022	eastern red bat	29	14	carcass search	70-m cleared plots	intact	yes*
10/03/2022	silver-haired bat	98	27	carcass search**	70-m uncleared plots	scavenged	yes*

Appendix A. Carcasses found at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Found Date	Species	Distance from Turbine	Turbine	Search Type	Search Area Type	Physical Condition	Aided Search
10/04/2022	big brown bat	2	17	carcass search	100-m road and pads	scavenged	no
10/04/2022	eastern red bat	6	34	carcass search	100-m road and pads	intact	no
10/04/2022	silver-haired bat	14	39	carcass search	70-m uncleared plots	scavenged	yes*
10/04/2022	silver-haired bat	72	40	carcass search**	70-m uncleared plots	scavenged	yes*
10/06/2022	eastern red bat	37	21	carcass search	70-m uncleared plots	scavenged	yes*
10/06/2022	silver-haired bat	51	28	carcass search	70-m cleared plots	scavenged	yes*
10/06/2022	silver-haired bat	48	28	carcass search	70-m cleared plots	scavenged	yes*
10/07/2022	Indiana bat	26	36	carcass search	70-m uncleared plots	intact	yes*
10/07/2022	Indiana bat	11	39	carcass search	70-m uncleared plots	intact	yes*
10/10/2022	silver-haired bat	21	39	carcass search	70-m uncleared plots	scavenged	yes*
10/10/2022	silver-haired bat	41	49	carcass search	70-m uncleared plots	scavenged	yes*
10/11/2022	eastern red bat	72	26	carcass search**	70-m cleared plots	scavenged	yes*
10/11/2022	eastern red bat	9	36	carcass search	70-m uncleared plots	scavenged	yes*
10/11/2022	silver-haired bat	44	27	carcass search	70-m uncleared plots	scavenged	yes*
10/14/2022	silver-haired bat	14	26	carcass search	70-m cleared plots	scavenged	yes*
Birds							
04/05/2022	European starling	16	3	carcass search**	100-m road and pads	scavenged	no
04/11/2022	golden-crowned kinglet	96	1	carcass search	100-m road and pads	intact	no
05/03/2022	red-tailed hawk	13	45	carcass search**	100-m road and pads	intact	no
05/09/2022	horned lark	1	17	carcass search	100-m road and pads	intact	no
05/17/2022	unidentified passerine	15	35	carcass search	70-m uncleared plots	feather spot	yes*
05/19/2022	horned lark	47	33	carcass search	70-m cleared plots	scavenged	yes*
05/19/2022	red-eyed vireo	52	36	carcass search	70-m uncleared plots	scavenged	yes*
05/23/2022	cedar waxwing	50	11	carcass search	70-m cleared plots	scavenged	yes*
05/23/2022	horned lark	56	14	carcass search	70-m cleared plots	scavenged	yes*
05/23/2022	magnolia warbler	65	18	carcass search	70-m uncleared plots	dismembered	yes*
05/24/2022	chimney swift	42	35	carcass search	70-m uncleared plots	scavenged	yes*
06/01/2022	horned lark	24	27	carcass search	70-m uncleared plots	scavenged	yes*
06/01/2022	horned lark	47	35	carcass search	70-m uncleared plots	scavenged	yes*
06/01/2022	red-eyed vireo	16	35	carcass search	70-m uncleared plots	intact	yes*
06/02/2022	turkey vulture	64	36	carcass search	70-m uncleared plots	intact	yes*
06/03/2022	cedar waxwing	43	39	carcass search	70-m uncleared plots	scavenged	yes*
06/03/2022	yellow-billed cuckoo	26	44	carcass search	70-m cleared plots	feather spot	yes*
06/07/2022	red-tailed hawk	55	27	carcass search	70-m uncleared plots	intact	yes*
06/09/2022	horned lark	38	49	carcass search	70-m uncleared plots	scavenged	yes*
06/14/2022	Baltimore oriole	7	29	carcass search	100-m road and pads	scavenged	no
06/14/2022	horned lark	45	19	carcass search	70-m cleared plots	scavenged	yes*

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Found Date	Species	Distance from Turbine	Turbine	Search Type	Search Area Type	Physical Condition	Aided Search
06/16/2022	chimney swift	47	36	carcass search	70-m uncleared plots	scavenged	yes*
06/17/2022	black-billed cuckoo	51	39	carcass search	70-m uncleared plots	scavenged	yes*
06/23/2022	horned lark	44	40	carcass search	70-m uncleared plots	feather spot	yes*
06/23/2022	turkey vulture	77	40	carcass search**	70-m uncleared plots	scavenged	yes*
06/24/2022	turkey vulture	21	46	carcass search**	100-m road and pads	scavenged	no
07/01/2022	horned lark	69	49	carcass search	70-m uncleared plots	intact	yes*
07/11/2022	horned lark	28	11	carcass search	70-m cleared plots	scavenged	yes*
07/11/2022	horned lark	30	18	carcass search	70-m uncleared plots	scavenged	yes*
07/14/2022	American goldfinch	9	39	carcass search	70-m uncleared plots	scavenged	yes*
07/18/2022	horned lark	29	11	carcass search	70-m cleared plots	feather spot	yes*
07/18/2022	turkey vulture	44	11	carcass search	70-m cleared plots	dismembered	yes*
07/19/2022	barn swallow	24	27	carcass search	70-m uncleared plots	feather spot	yes*
07/28/2022	horned lark	38	28	carcass search	70-m cleared plots	scavenged	yes*
08/01/2022	cedar waxwing	0	50	carcass search	100-m road and pads	scavenged	no
08/01/2022	unidentified blackbird	35	21	carcass search	70-m uncleared plots	feather spot	yes*
08/02/2022	American kestrel	50	44	carcass search	70-m cleared plots	scavenged	yes*
08/02/2022	horned lark	86	22	carcass search**	100-m road and pads	scavenged	no
08/02/2022	horned lark	40	33	carcass search	70-m cleared plots	scavenged	yes*
08/04/2022	horned lark	33	18	carcass search	70-m uncleared plots	scavenged	yes*
08/05/2022	chimney swift	37	37	carcass search	70-m cleared plots	scavenged	yes*
08/05/2022	horned lark	87	33	carcass search**	70-m cleared plots	scavenged	yes*
08/05/2022	turkey vulture	62	44	carcass search	70-m cleared plots	scavenged	yes*
08/08/2022	horned lark	18	19	carcass search	70-m cleared plots	scavenged	yes*
08/08/2022	purple martin	41	14	carcass search	70-m cleared plots	intact	yes*
08/08/2022	unidentified passerine	57	28	carcass search	70-m cleared plots	feather spot	yes*
08/09/2022	horned lark	74	37	carcass search**	70-m cleared plots	scavenged	yes*
08/09/2022	purple martin	37	37	carcass search	70-m cleared plots	scavenged	yes*
08/16/2022	Blackburnian warbler	6	38	carcass search	100-m road and pads	scavenged	no
08/16/2022	horned lark	69	33	carcass search	70-m cleared plots	scavenged	yes*
08/16/2022	horned lark	72	37	carcass search**	70-m cleared plots	scavenged	yes*
08/16/2022	horned lark	69	44	carcass search**	70-m cleared plots	scavenged	yes*
08/17/2022	barn swallow	25	27	carcass search	70-m uncleared plots	scavenged	yes*
08/18/2022	horned lark	43	37	carcass search	70-m cleared plots	scavenged	yes*
08/19/2022	Cape May warbler	18	40	carcass search	70-m uncleared plots	scavenged	yes*
08/23/2022	horned lark	48	33	carcass search	70-m cleared plots	scavenged	yes*
08/25/2022	chimney swift	47	35	carcass search**	70-m uncleared plots	scavenged	yes*
08/25/2022	horned lark	43	11	carcass search	70-m cleared plots	scavenged	yes*

Appendix A. Carcasses found at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Found Date	Species	Distance from Turbine	Turbine	Search Type	Search Area Type	Physical Condition	Aided Search
08/25/2022	horned lark	44	28	carcass search	70-m cleared plots	scavenged	yes*
08/25/2022	horned lark	14	28	carcass search	70-m cleared plots	intact	yes*
08/25/2022	turkey vulture	40	1	carcass search**	100-m road and pads	scavenged	no
08/26/2022	horned lark	62	26	carcass search	70-m cleared plots	feather spot	yes*
08/29/2022	horned lark	36	19	carcass search	70-m cleared plots	scavenged	yes*
08/29/2022	horned lark	17	28	carcass search	70-m cleared plots	scavenged	yes*
08/29/2022	indigo bunting	8	51	carcass search	100-m road and pads	scavenged	no
09/01/2022	American redstart	49	11	carcass search	70-m cleared plots	scavenged	yes*
09/02/2022	horned lark	45	22	carcass search	100-m road and pads	scavenged	no
09/02/2022	horned lark	20	26	carcass search	70-m cleared plots	scavenged	yes*
09/02/2022	Tennessee warbler	20	33	carcass search	70-m cleared plots	scavenged	yes*
09/05/2022	horned lark	56	18	carcass search	70-m uncleared plots	scavenged	yes*
09/06/2022	mourning dove	4	16	carcass search	100-m road and pads	scavenged	no
09/08/2022	American redstart	1	6	carcass search	100-m road and pads	scavenged	no
09/08/2022	horned lark	18	28	carcass search	70-m cleared plots	intact	yes*
09/09/2022	American redstart	38	32	carcass search**	100-m road and pads	scavenged	no
09/12/2022	horned lark	56	19	carcass search	70-m cleared plots	scavenged	yes*
09/12/2022	killdeer	59	11	carcass search	70-m cleared plots	dismembered	yes*
09/13/2022	horned lark	24	37	carcass search	70-m cleared plots	scavenged	yes*
09/15/2022	horned lark	41	19	carcass search	70-m cleared plots	feather spot	yes*
09/15/2022	red-tailed hawk	20	21	carcass search	70-m uncleared plots	scavenged	yes*
09/20/2022	horned lark	39	37	carcass search	70-m cleared plots	scavenged	yes*
09/20/2022	magnolia warbler	53	37	carcass search	70-m cleared plots	scavenged	yes*
09/22/2022	American redstart	24	35	carcass search	70-m uncleared plots	scavenged	yes*
09/23/2022	European starling	11	12	carcass search**	100-m road and pads	intact	no
09/27/2022	common yellowthroat	8	17	carcass search	100-m road and pads	scavenged	no
09/27/2022	killdeer	33	40	carcass search	70-m uncleared plots	dismembered	yes*
09/27/2022	red-breasted nuthatch	47	49	carcass search	70-m uncleared plots	scavenged	yes*
09/29/2022	killdeer	27	11	carcass search	70-m cleared plots	scavenged	yes*
09/30/2022	horned lark	8	37	carcass search	70-m cleared plots	scavenged	yes*

Appendix A. Carcasses found at the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Found Date	Species	Distance from Turbine	Turbine	Search Type	Search Area Type	Physical Condition	Aided Search
10/03/2022	gray catbird	53	19	carcass search	70-m cleared plots	scavenged	yes*
10/03/2022	common yellowthroat	62	28	carcass search	70-m cleared plots	scavenged	yes*
10/04/2022	golden-crowned kinglet	53	24	carcass search	100-m road and pads	intact	no
10/06/2022	Nashville warbler	77	49	carcass search**	70-m uncleared plots	intact	yes*
10/06/2022	pine warbler	74	49	carcass search**	70-m uncleared plots	intact	yes*
10/08/2022	mourning dove	60	44	carcass search	70-m cleared plots	feather spot	yes*
10/10/2022	pine warbler	51	14	carcass search	70-m cleared plots	intact	yes*

* Dog aided search.

** Carcass was found outside the search area.

m = meters.

Appendix B. Truncated Weighted Likelihood Area Adjustment Estimate Model Fitting Results

Appendix B1. Search area adjustment models for bats from the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Distribution	AICc	Delta AICc
Weibull	21,431.20	0*
gamma	21,441.77	10.57
normal	21,557.87	126.67
Gompertz	21,715.04	283.85

* Selected model.

AICc = Corrected Akaike Information Criterion.

Delta AICc = Change in AICc.

Appendix B2. Truncated weighted maximum likelihood search area estimates for the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Size Class	Search Area Type	Distribution	Parameter 1	Parameter 2	Area Adjustment
	70-m cleared plots	Weibull	1.7550	36.1868	0.95
Bat	70-m uncleared plots	Weibull	1.7550	36.1868	0.92
	100-m road and pads	Weibull	1.7550	36.1868	0.10

m = meters.

n = 496 bats.

Appendix C. Inputs for Single Class and Multiple Class Modules in Evidence of Absence

Appendix C1. Inputs needed to run Evidence of Absence (EoA): Single Class Module for the Bitter Ridge Wind Farm, Jay County, Indiana, from April 1 – October 15, 2022.

Season	Plot Type	Search Interval (l)	Number of searches**	Spatial Coverage (a)	Searcher Efficiency Carcasses available	Searcher Efficiency Carcasses found	Carcass Persistence* Shape (α)	Carcass Persistence* Scale (β)
spring	100-m road and pads	7	6	0.10	62	57	1.3	5.3
summer	100-m road and pads	7	11	0.10	62	57	1.3	5.3
summer	70-m cleared plots	7	11	0.95	87	73	0.75	19.0
summer	70-m uncleared plots	7	11	0.92	87	73	0.75	19.0
fall	100-m road and pads	3.5	21	0.10	62	57	1.3	5.3
fall	70-m cleared plots	3.5	22	0.95	87	73	0.75	19.0
fall	70-m uncleared plots	3.5	22	0.92	87	73	0.75	19.0

* A loglogistic distribution was used for carcass persistence distribution.

** This shows the actual number of searches. If using the EoA Graphical User Interface, it is necessary to add a search to each of the values because the EoA Graphical User Interface automatically subtracts one search as a clearing search.

m = meters.

Appendix C2. Inputs needed to run Evidence of Absence to combine across plot types within seasons: Multiple Class Module for the Bitter Ridge Wind Farm, Jay County, Indiana, from 2022.

Season	Plot Type	Ba	Bb	Within-season Sampling Fraction (DWP)
spring	100-m road and pads	92.93	1,485.57	1.00
summer	100-m road and pads	103.34	1,648.31	0.57
summer	70-m cleared plots	105.36	55.038	0.22
summer	70-m uncleared plots	117.93	66.09	0.22
fall	100-m road and pads	228.52	2,883.60	0.69
fall	70-m cleared plots	162.64	53.29	0.15
fall	70-m uncleared plots	162.98	59.96	0.15

m = meter.

Appendix C3. Inputs needed to run the Evidence of Absence to combine across seasons: Multiple Class Module for the Bitter Ridge Wind Farm, Jay County, Indiana, from 2022.

Season	Ba	Bb	Arrival Proportions (DWP)
Spring (April 1 – May 15)	92.93	1,485.57	0.07
Summer (May 16 – July 30)	505.95	1,104.98	0.36
Fall (August 1 – October 15)	1,089.86	2,813.88	0.57

Appendix C4. Inputs needed to run the Evidence of Absence: Multiple Years Module for the Bitter Ridge Wind Farm, Jay County, Indiana, from 2022.

Year	Ba	Bb	Weights (ρ)
2021	1559.98	3145.32	0.76
2022	1613.628	4226.04	1

Attachments

Attachment A: Bitter Ridge ITP Turbine Data

Bitter Ridge ITP Turbine Data

Dates	Requirement	Season	High Risk Curtailment Criteria	Normal Risk Curtailment Criteria
4/6/2022	ITP	Spring Migration	'feathered' below 3 m/s, no temp threshold.	'feathered' below 3 m/s, no temp threshold.
5/13/2022	ITP	Spring Migration	'feathered' below 3 m/s, no temp threshold.	'feathered' below 3 m/s, no temp threshold.
6/8/2022	ITP	Summer Maternity	'feathered' below 5 m/s, and temp threshold of 10 C.	'feathered' below 3 m/s, and temp threshold of 10 C.
7/18/2022	ITP	Summer Maternity	'feathered' below 5 m/s, and temp threshold of 10 C.	'feathered' below 3 m/s, and temp threshold of 10 C.
7/26/2022	ITP	Summer Maternity	'feathered' below 5 m/s, and temp threshold of 10 C.	'feathered' below 3 m/s, and temp threshold of 10 C.
8/1/2022	ITP	Fall Migration	'feathered' below 5 m/s, and temp threshold of 10 C.	'feathered' below 5 m/s, and temp threshold of 10 C.
9/25/2022	ITP	Fall Migration	'feathered' below 5 m/s, and temp threshold of 10 C.	'feathered' below 5 m/s, and temp threshold of 10 C.
10/9/2022	ITP	Fall Migration	'feathered' below 5 m/s, and temp threshold of 10 C.	'feathered' below 5 m/s, and temp threshold of 10 C.

Turbines	Risk Category
BTRG-WTG004	Normal Risk
BTRG-WTG017	High Risk
BTRG-WTG029	High Risk
BTRG-WTG032	High Risk
BTRG-WTG050	High Risk

BTRG-WTG004

BTRG-WTG004, 04-06-2022, Spring Migration, ITP with normal risk, wind speed limit 3 m/s and temperature limit 10 C
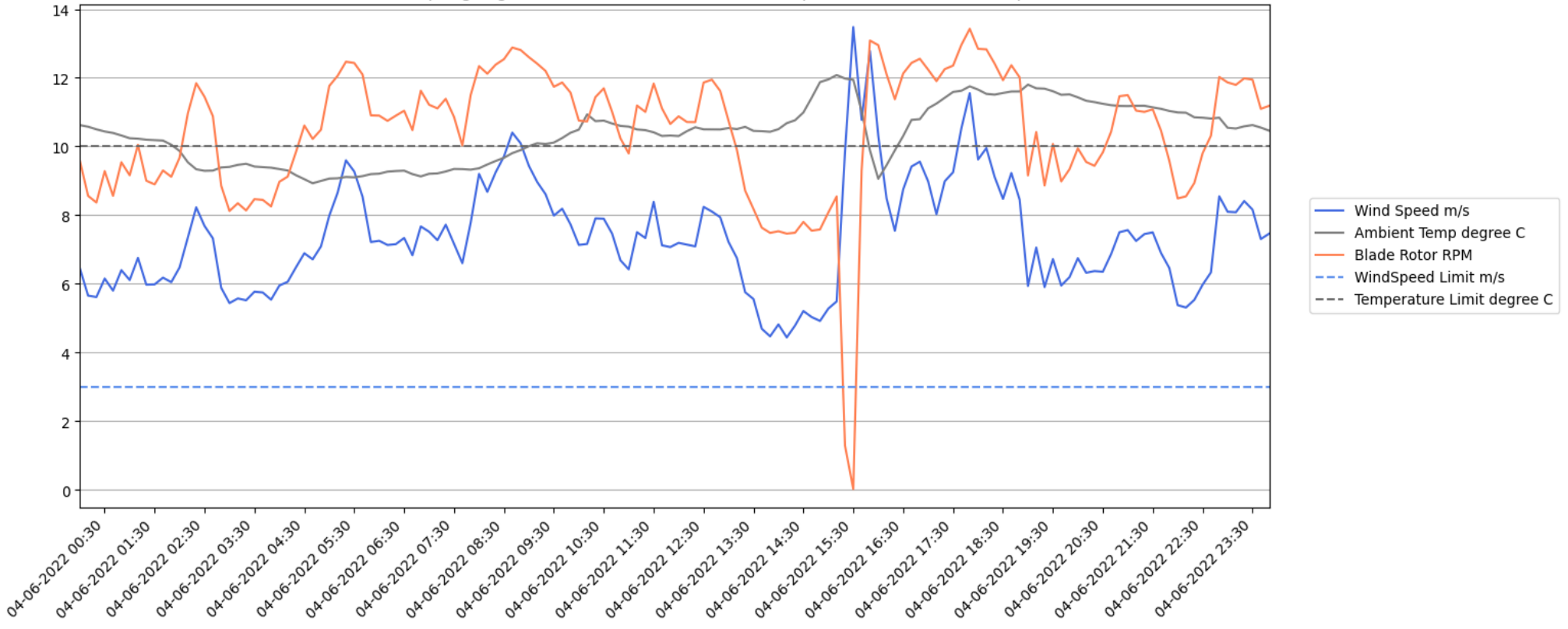
BTRG-WTG004

BTRG-WTG004, 05-13-2022, Spring Migration, ITP with normal risk, wind speed limit 3 m/s and temperature limit 10 C
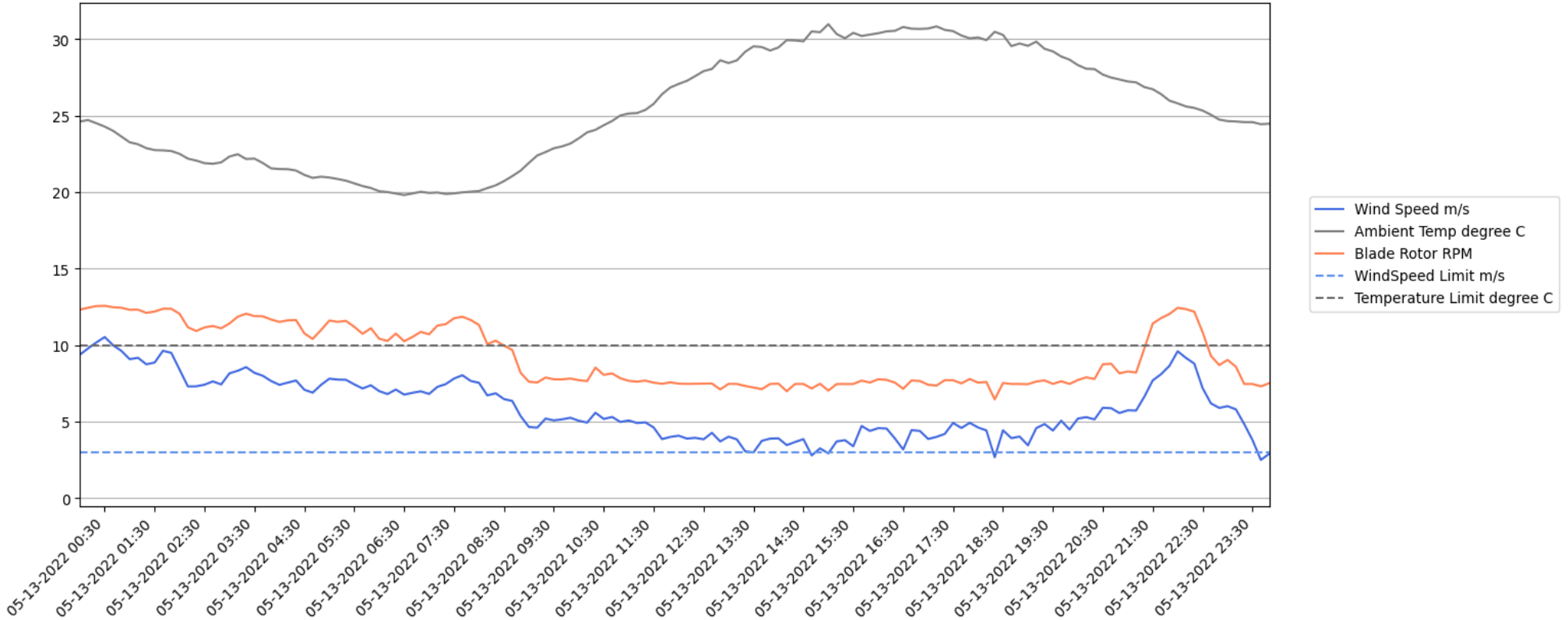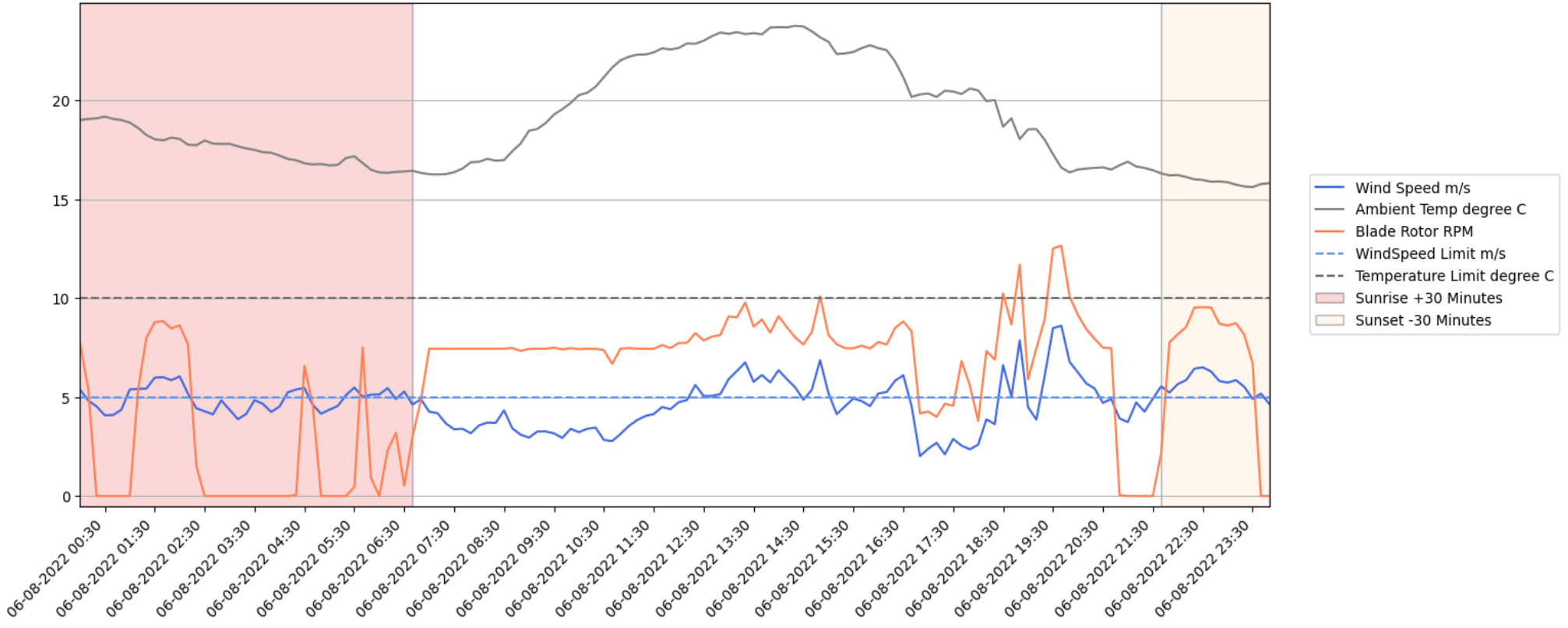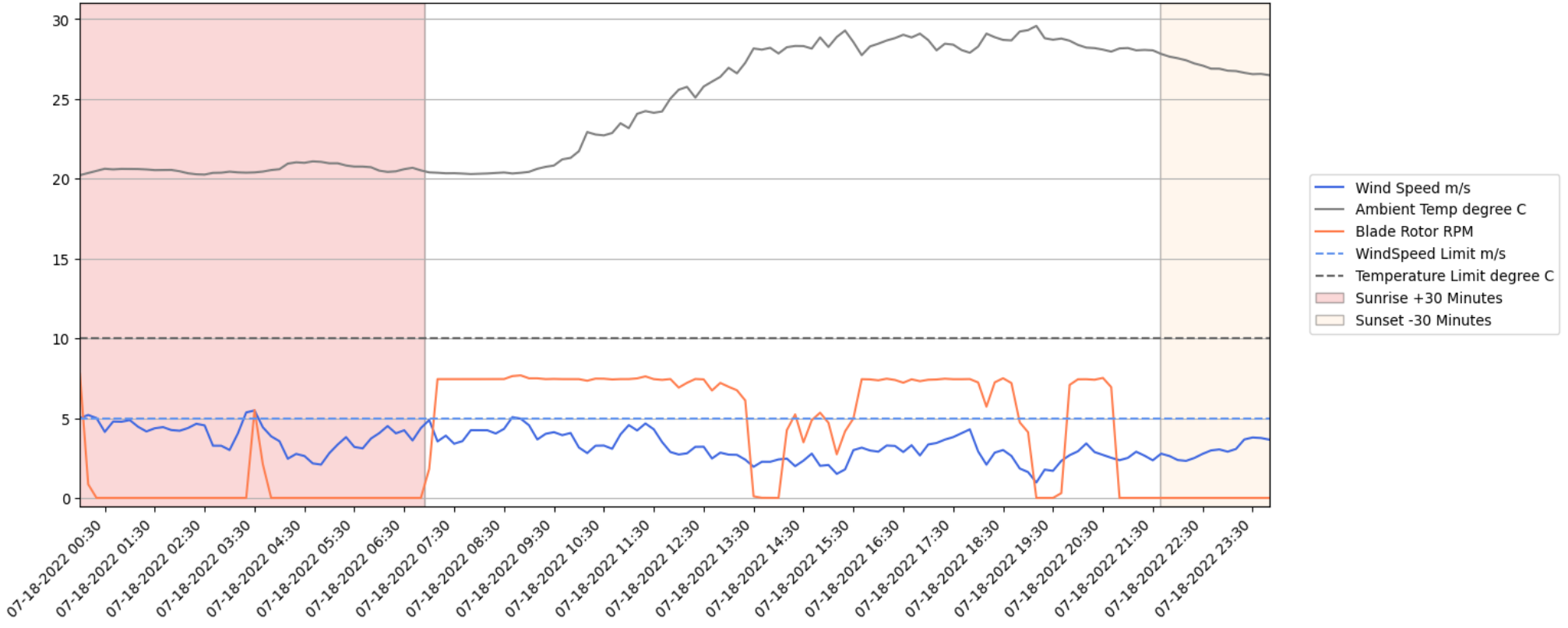
BTRG-WTG004

BTRG-WTG004, 06-08-2022, Summer Maternity, ITP with normal risk, wind speed limit 3 m/s and temperature limit 10 C
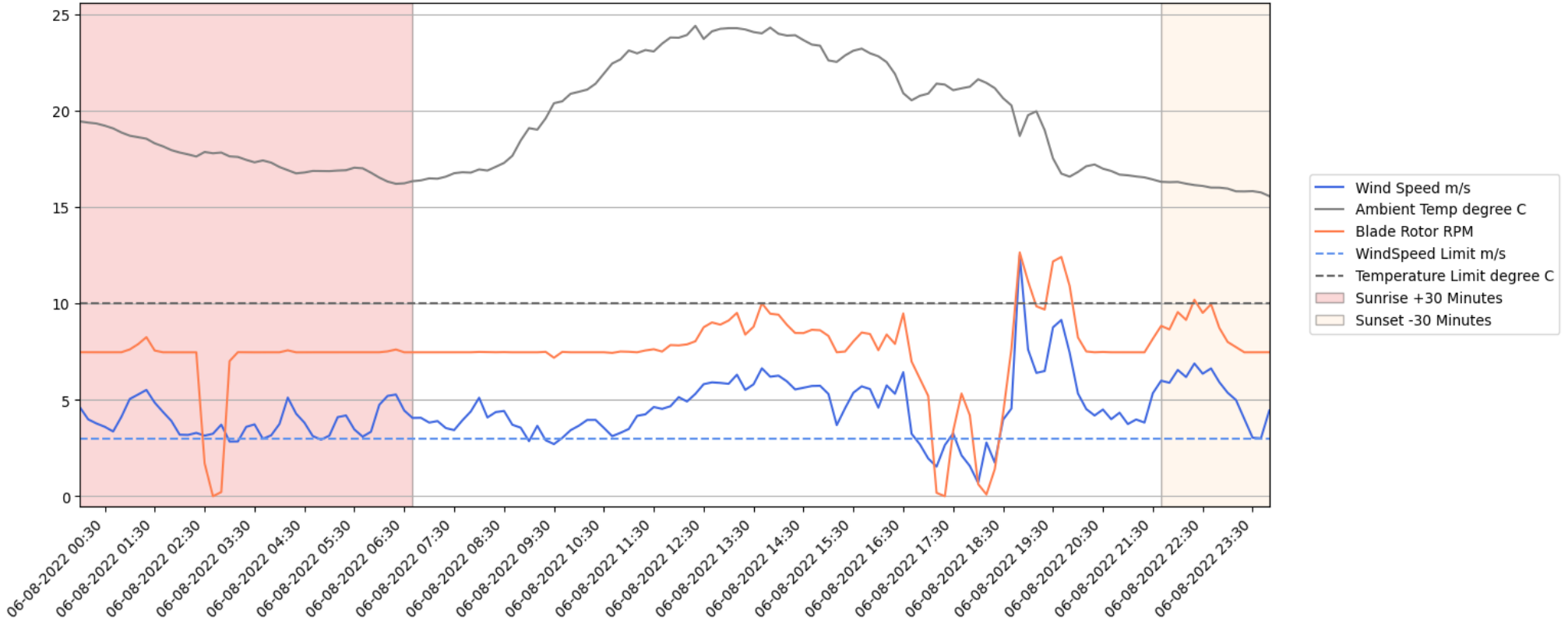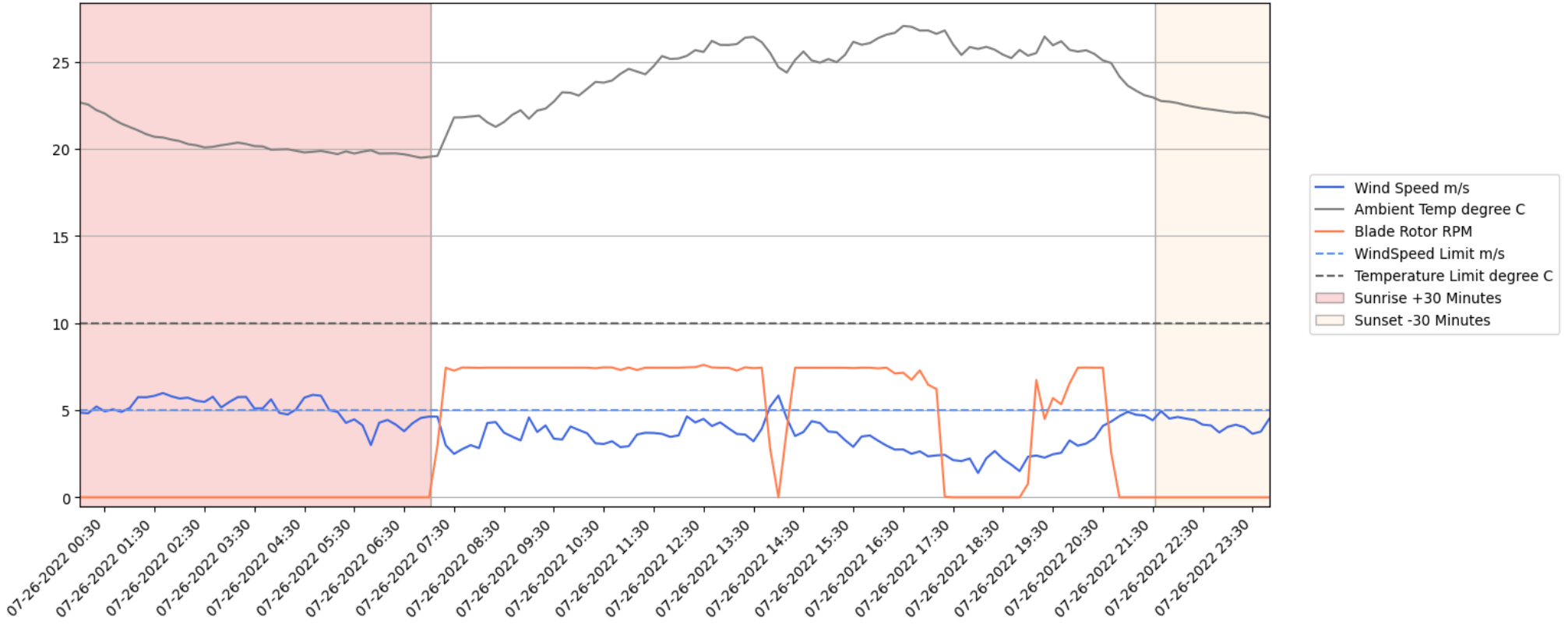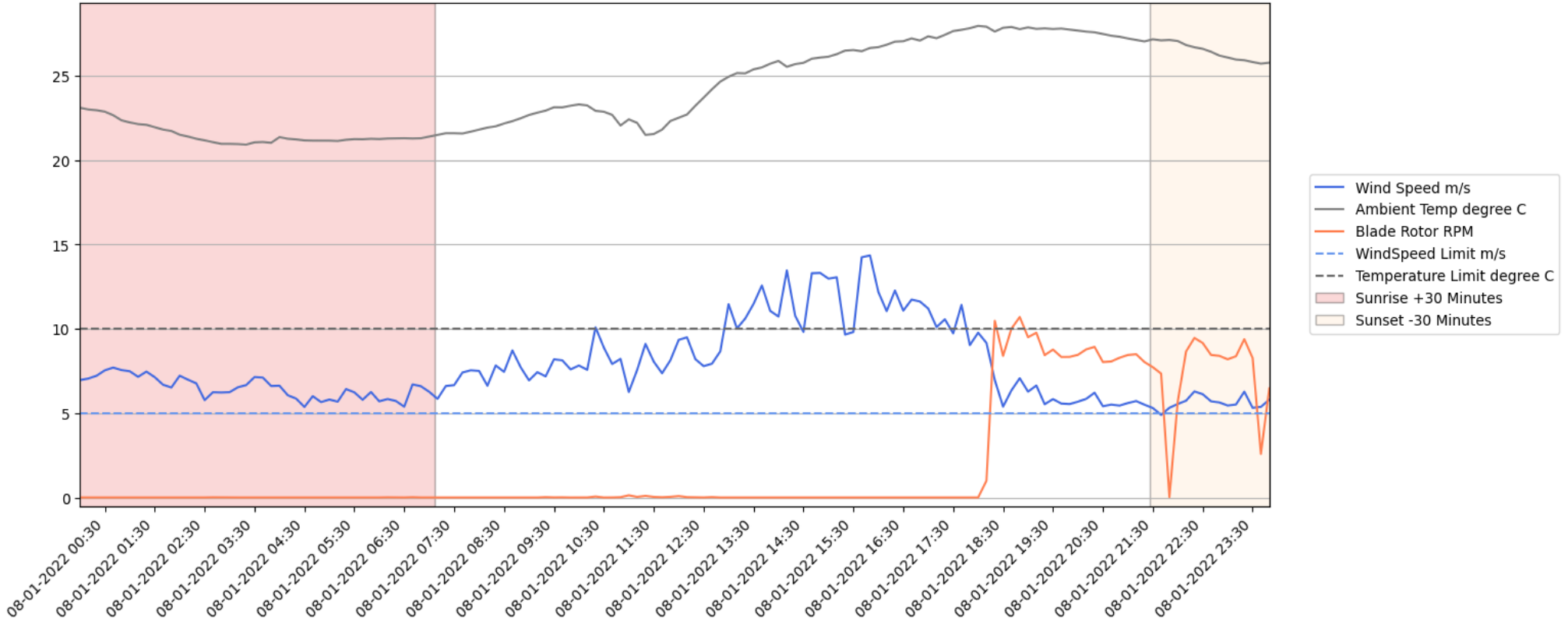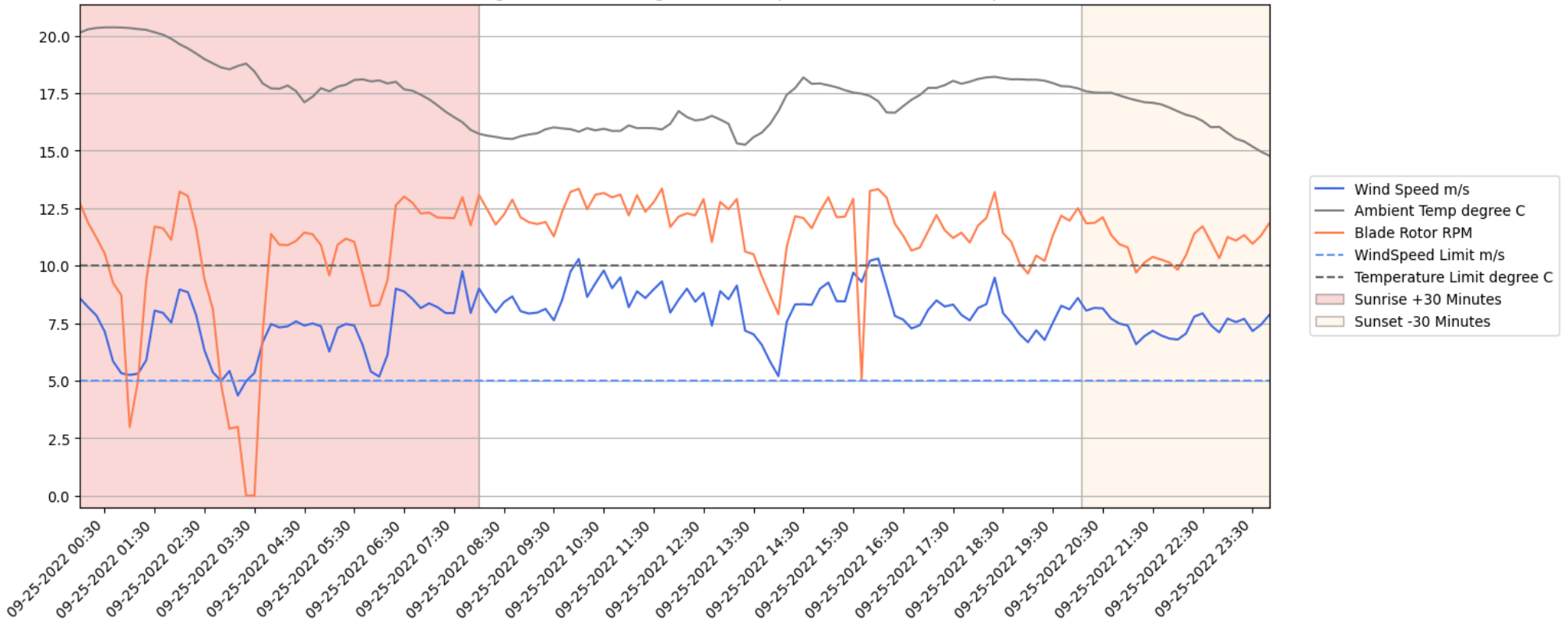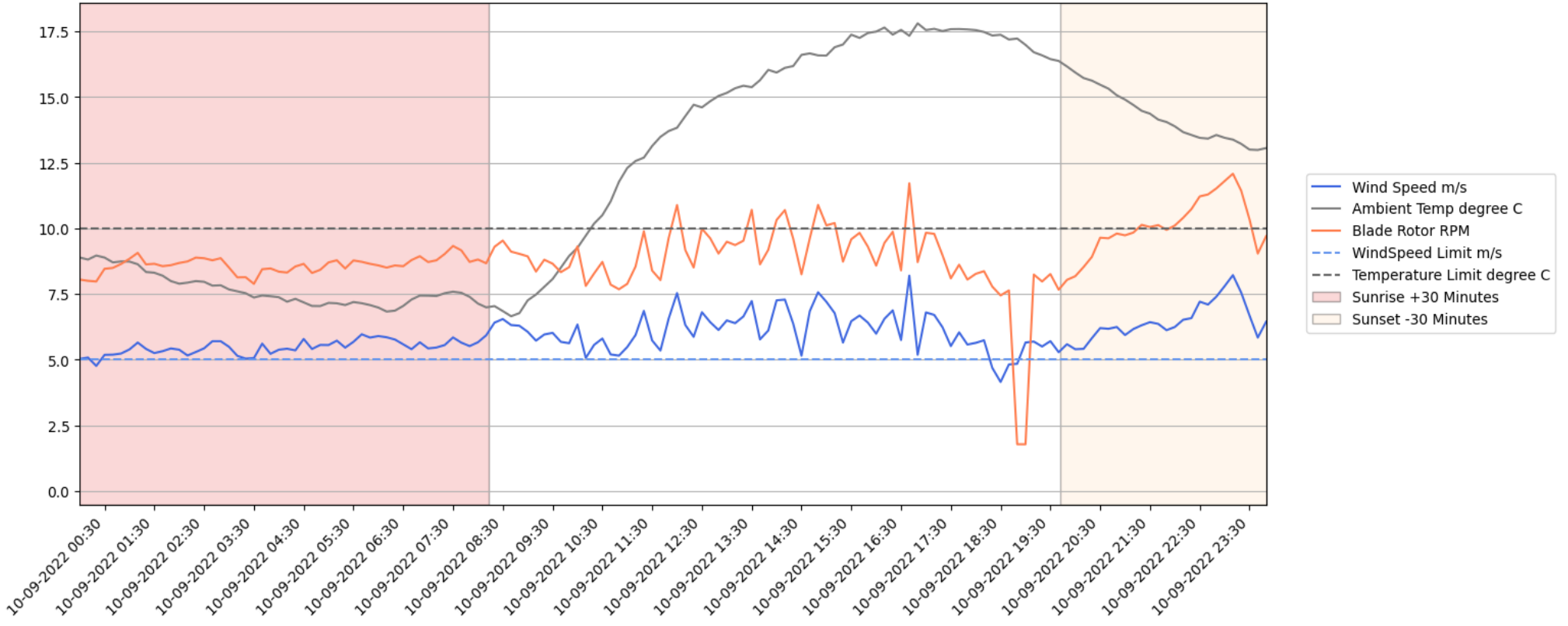
BTRG-WTG004

BTRG-WTG004, 07-18-2022, Summer Maternity, ITP with normal risk, wind speed limit 3 m/s and temperature limit 10 C
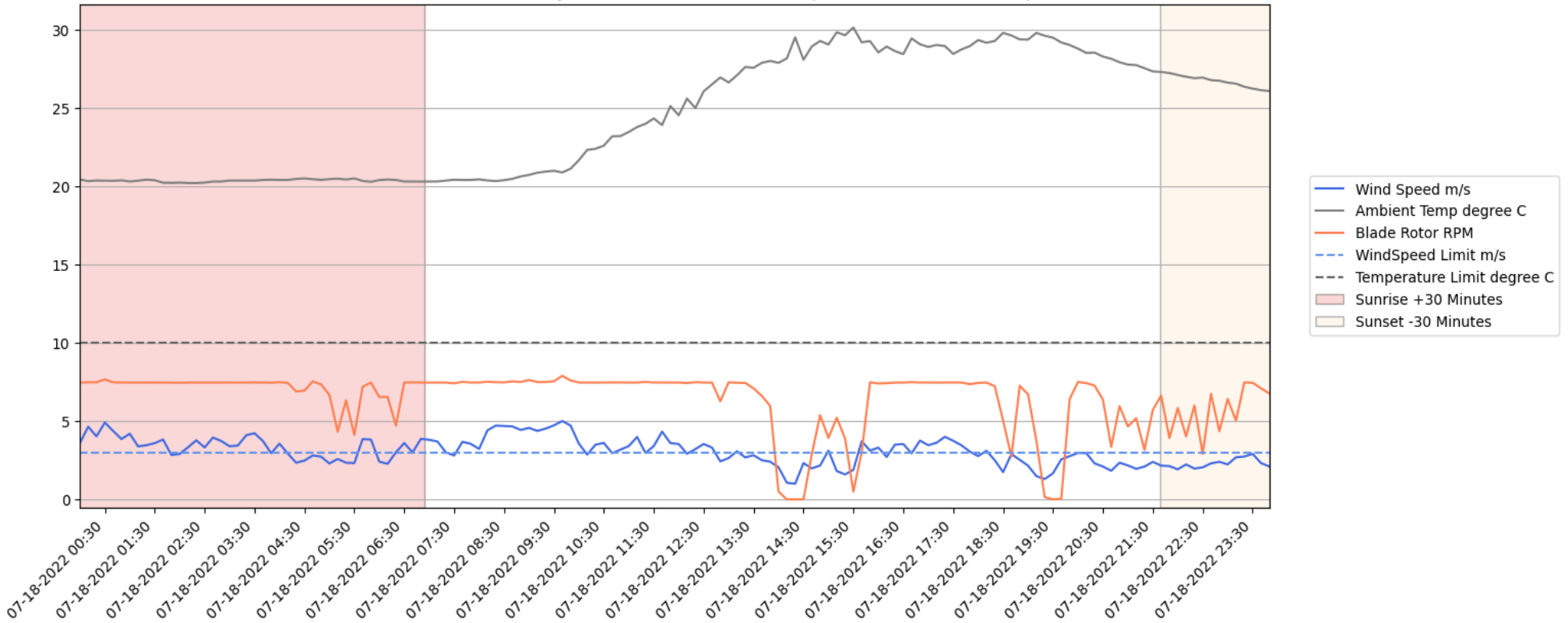
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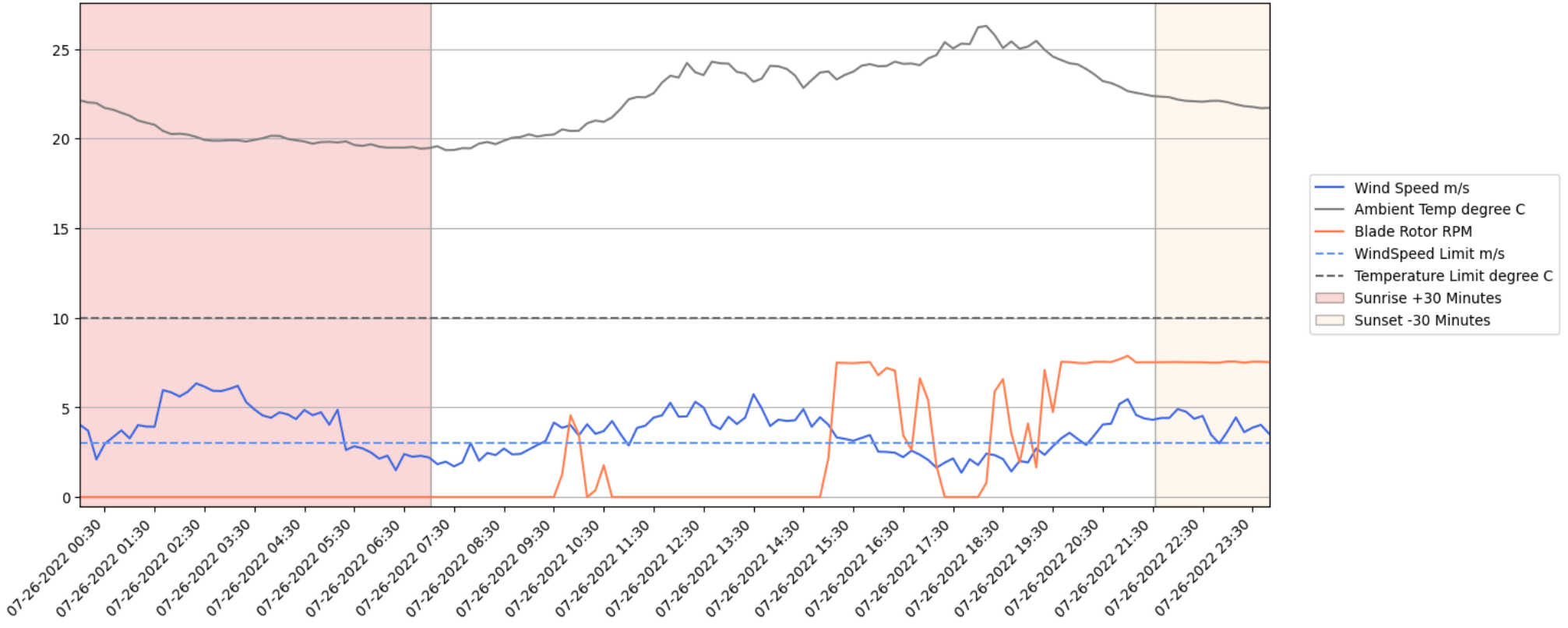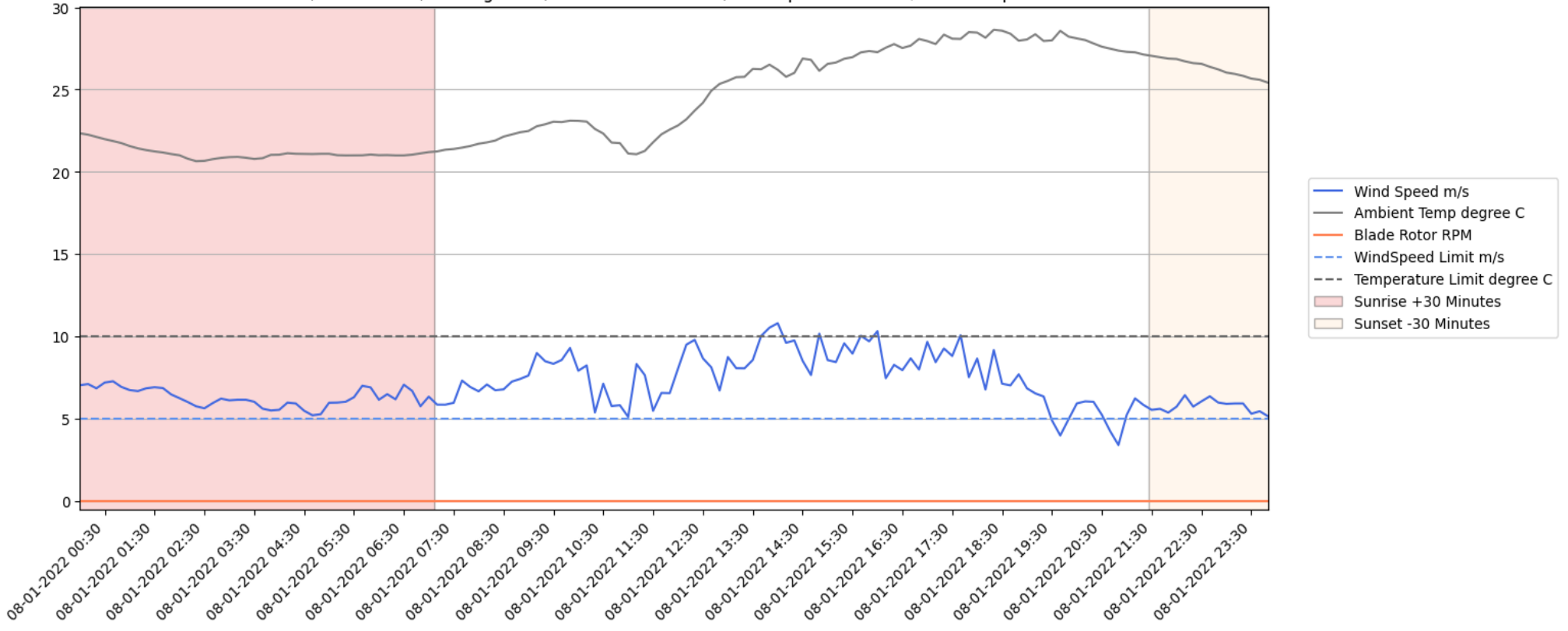
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BTRG-WTG004

BTRG-WTG004, 09-25-2022, Fall Migration, ITP with normal risk, wind speed limit 5 m/s and temperature limit 10 C
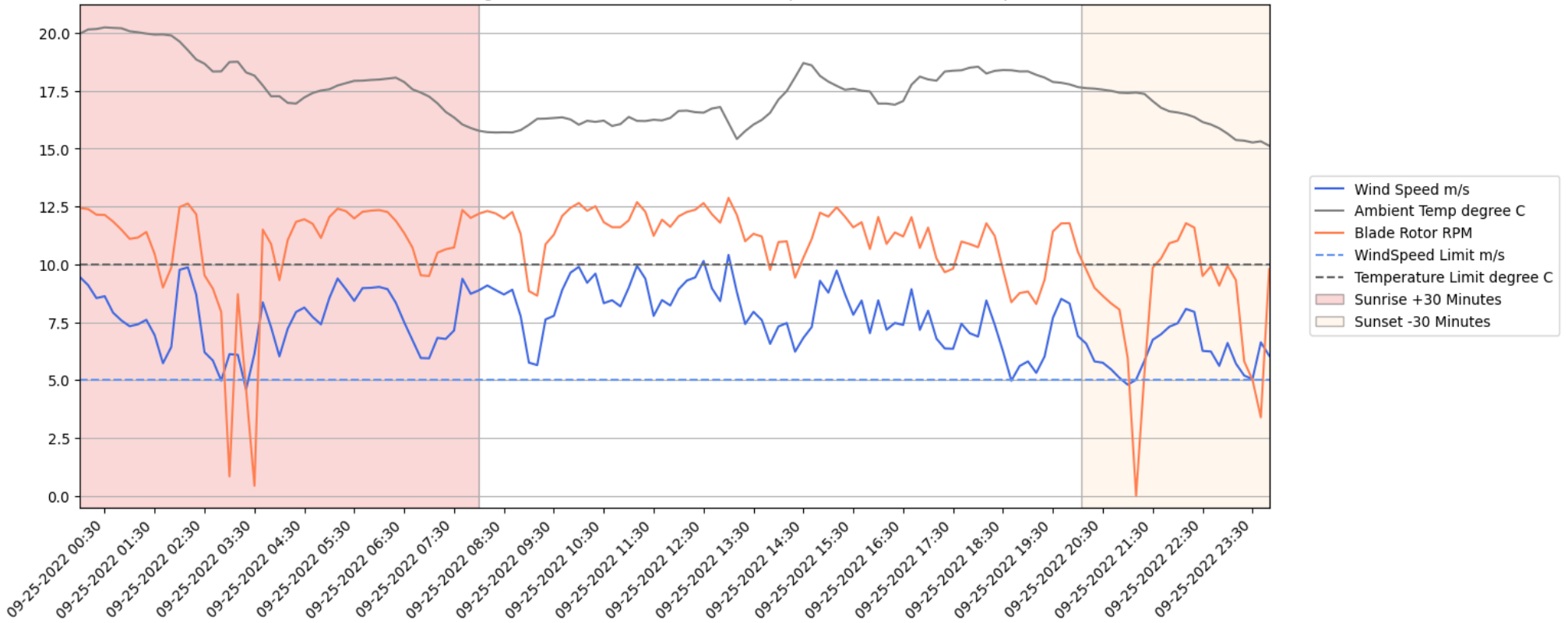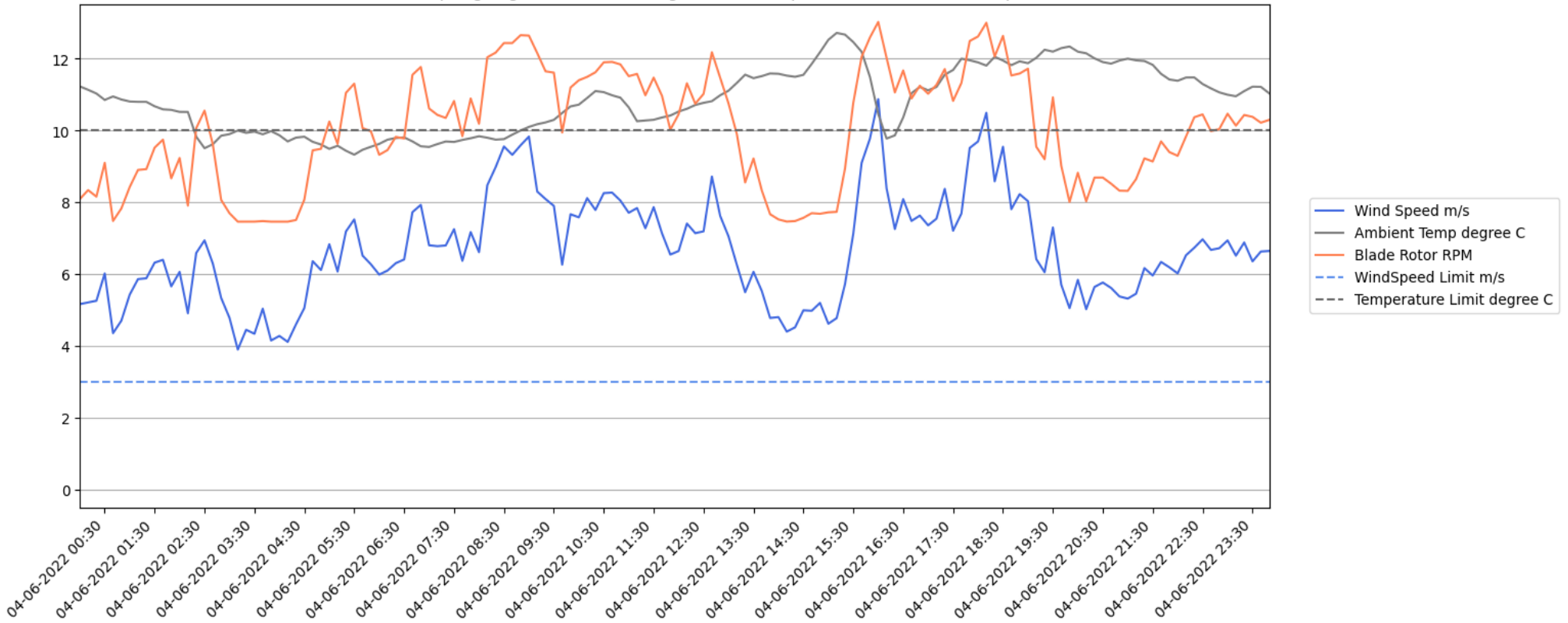
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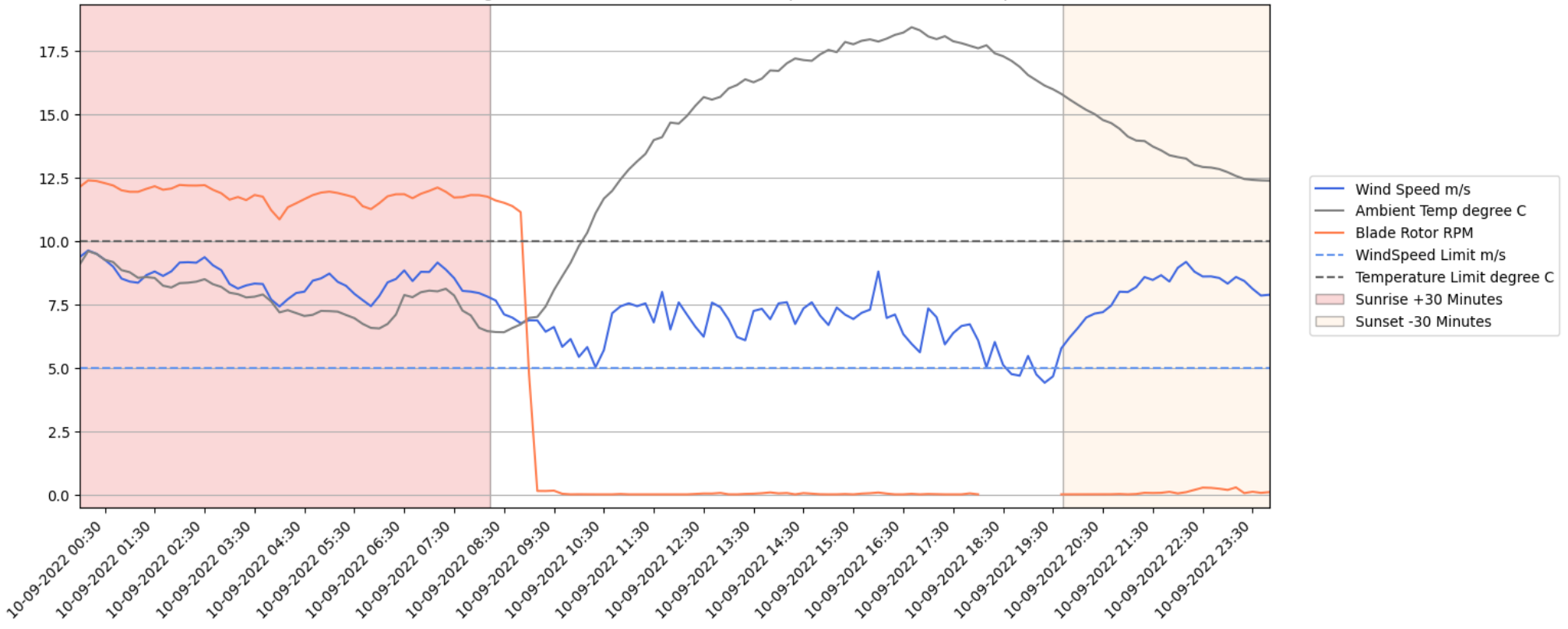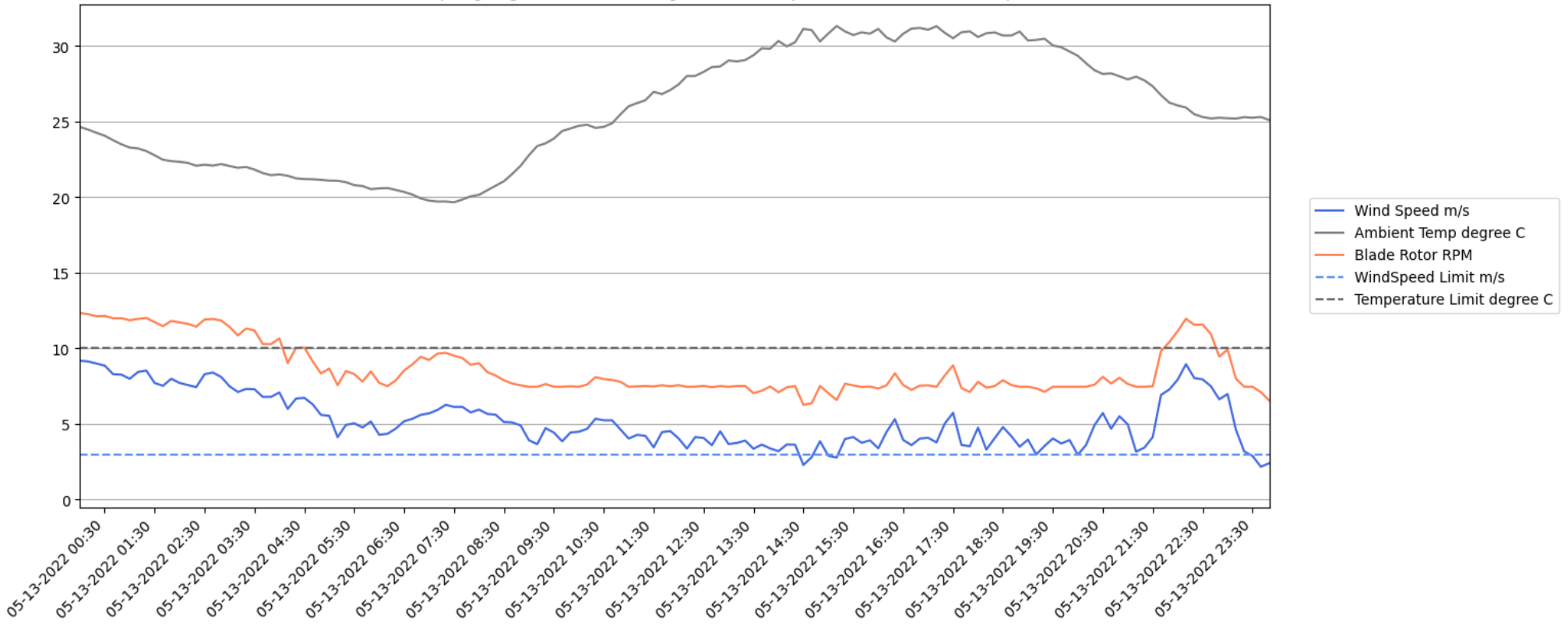
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BTRG-WTG017, 04-06-2022, Spring Migration, ITP with high risk, wind speed limit 3 m/s and temperature limit 10 C
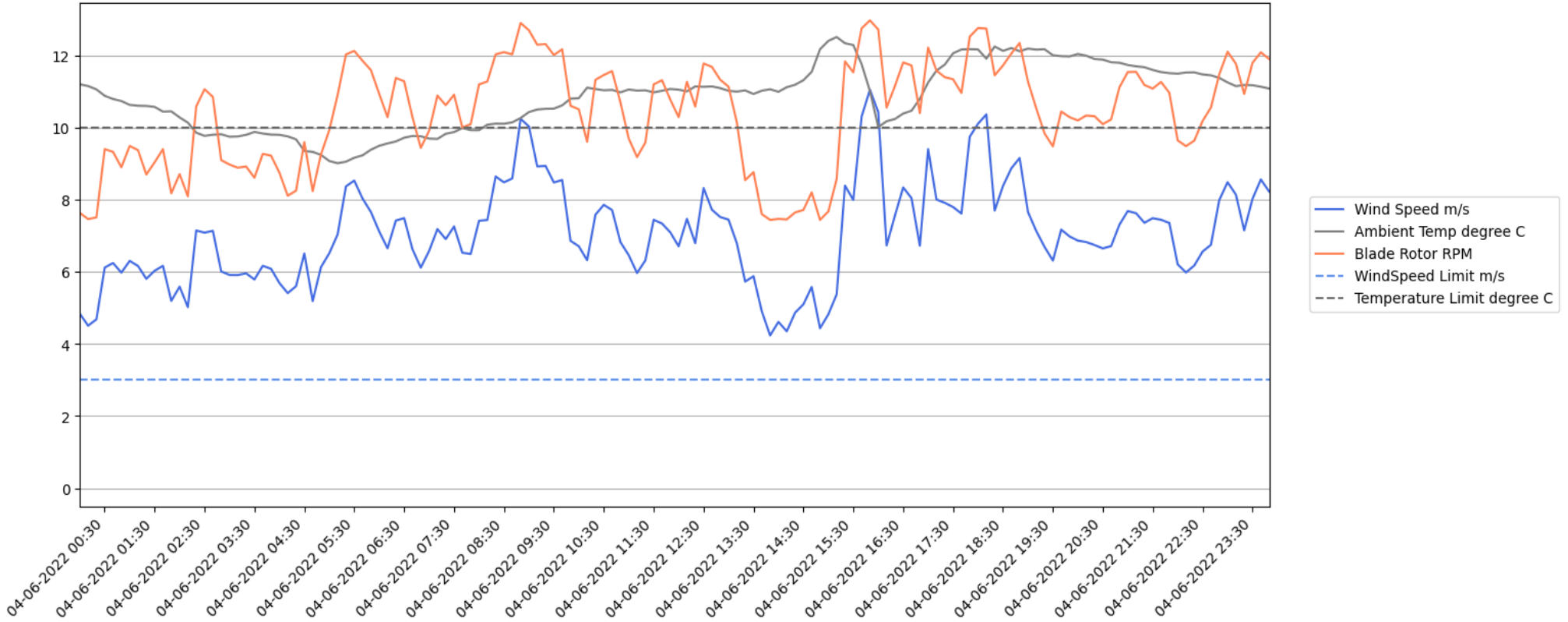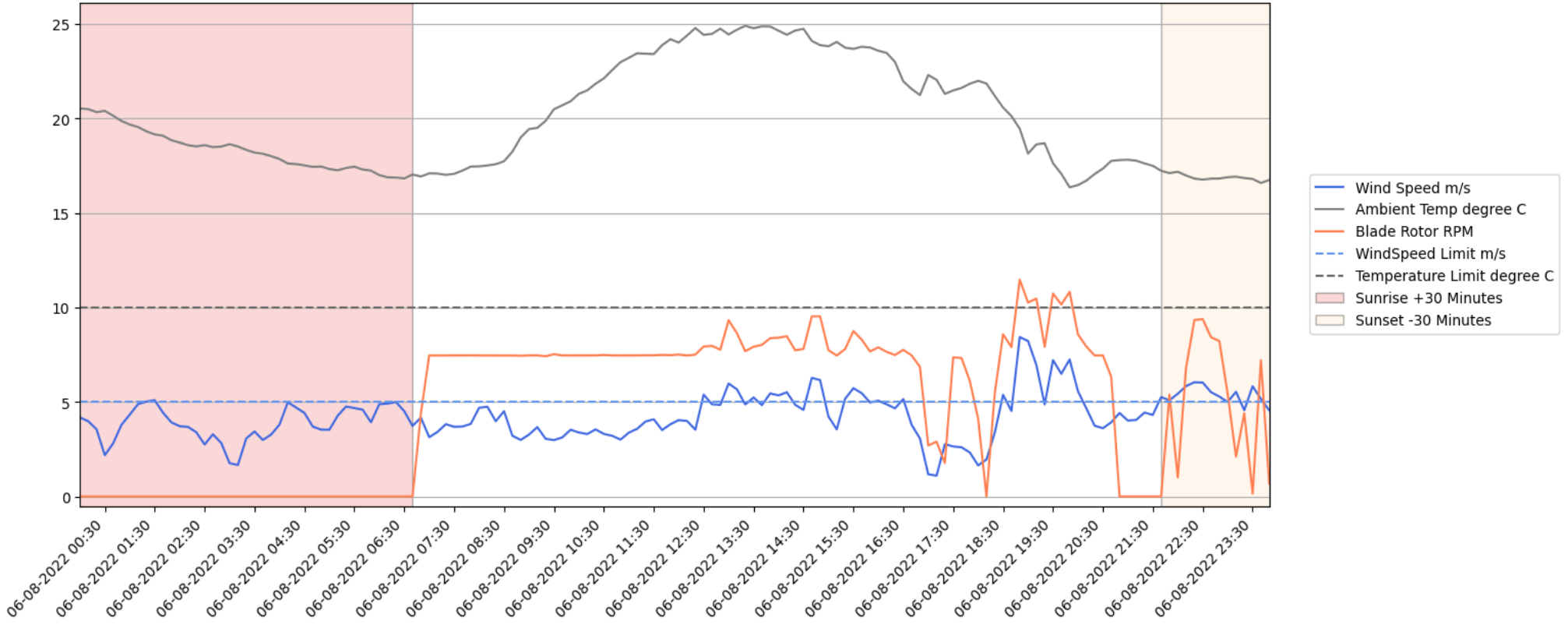
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BTRG-WTG017, 05-13-2022, Spring Migration, ITP with high risk, wind speed limit 3 m/s and temperature limit 10 C
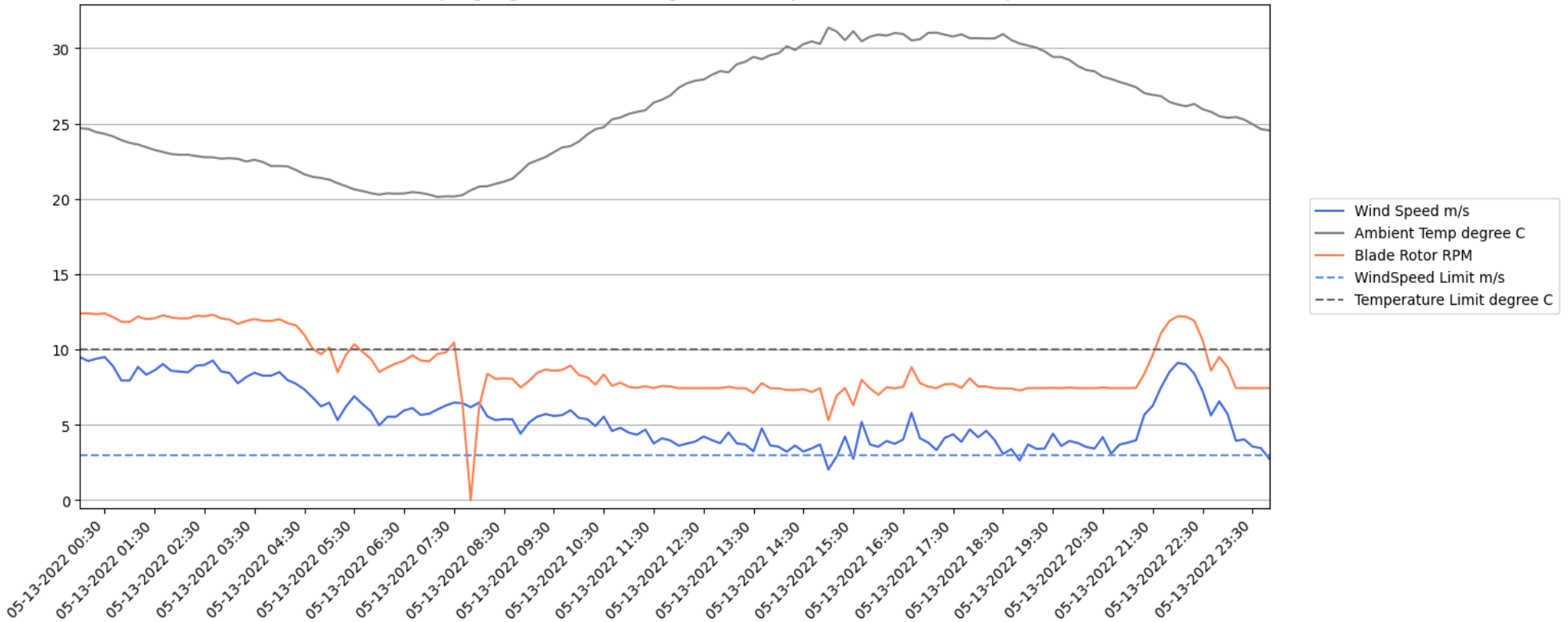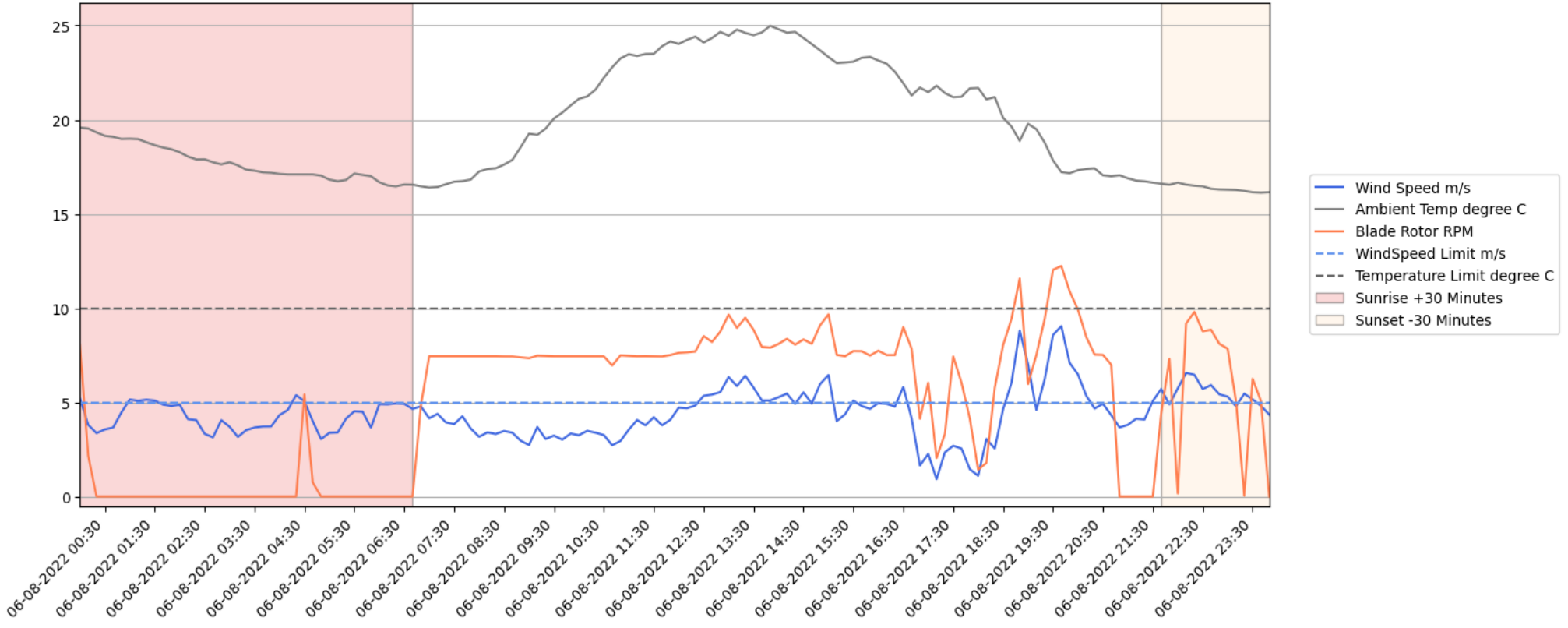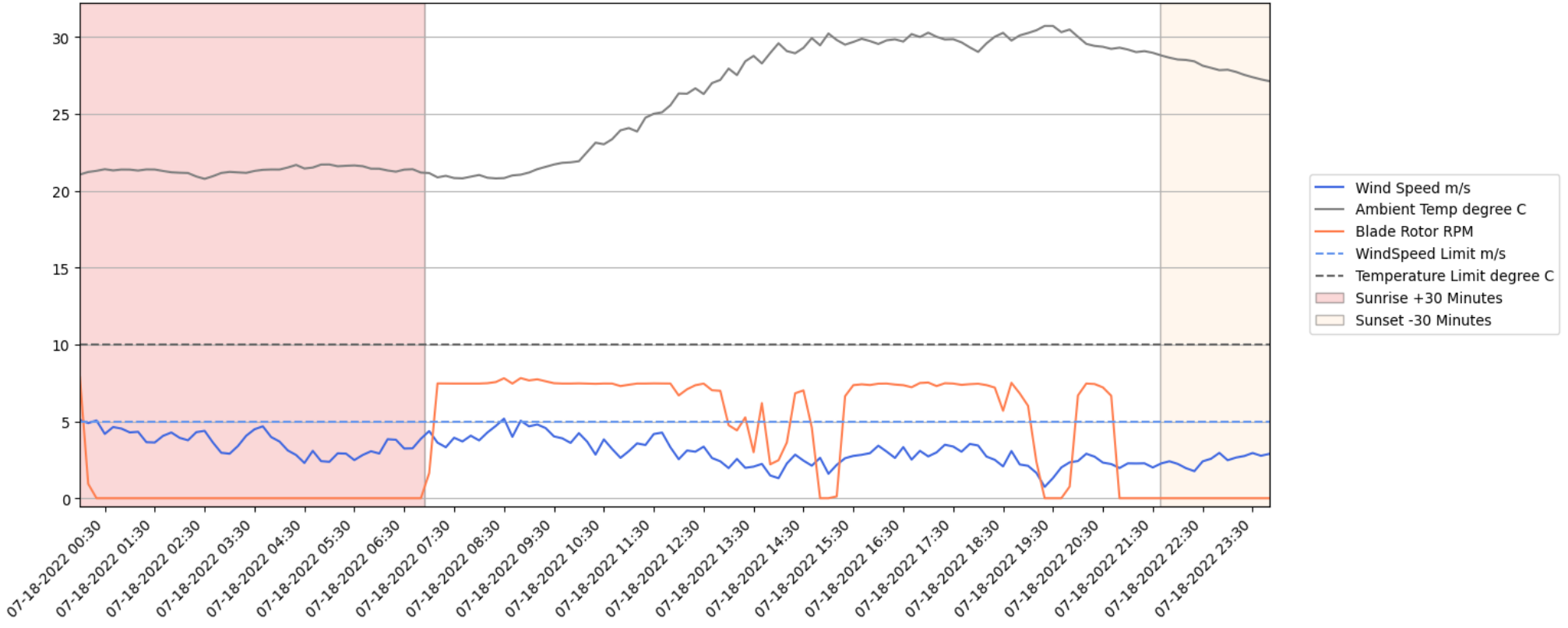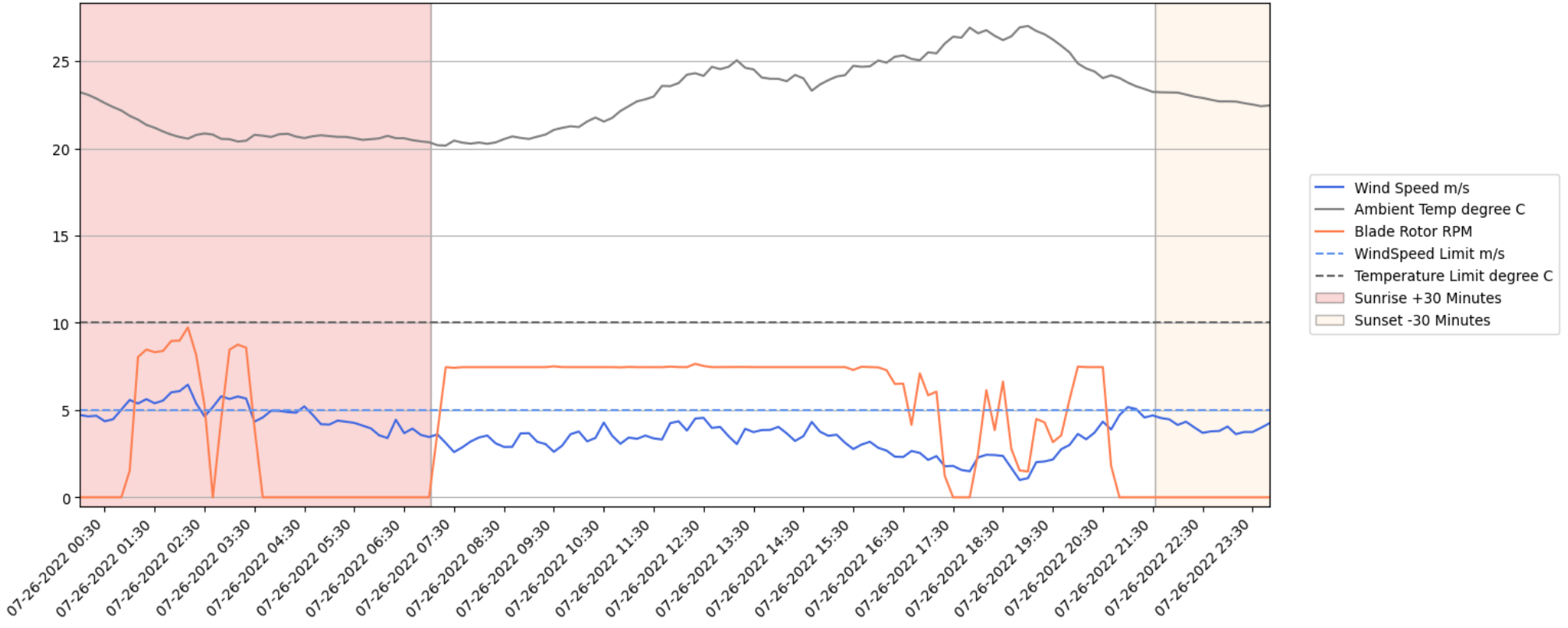
BTRG-WTG017

BTRG-WTG017

BTRG-WTG017, 07-18-2022, Summer Maternity, ITP with high risk, wind speed limit 5 m/s and temperature limit 10 C
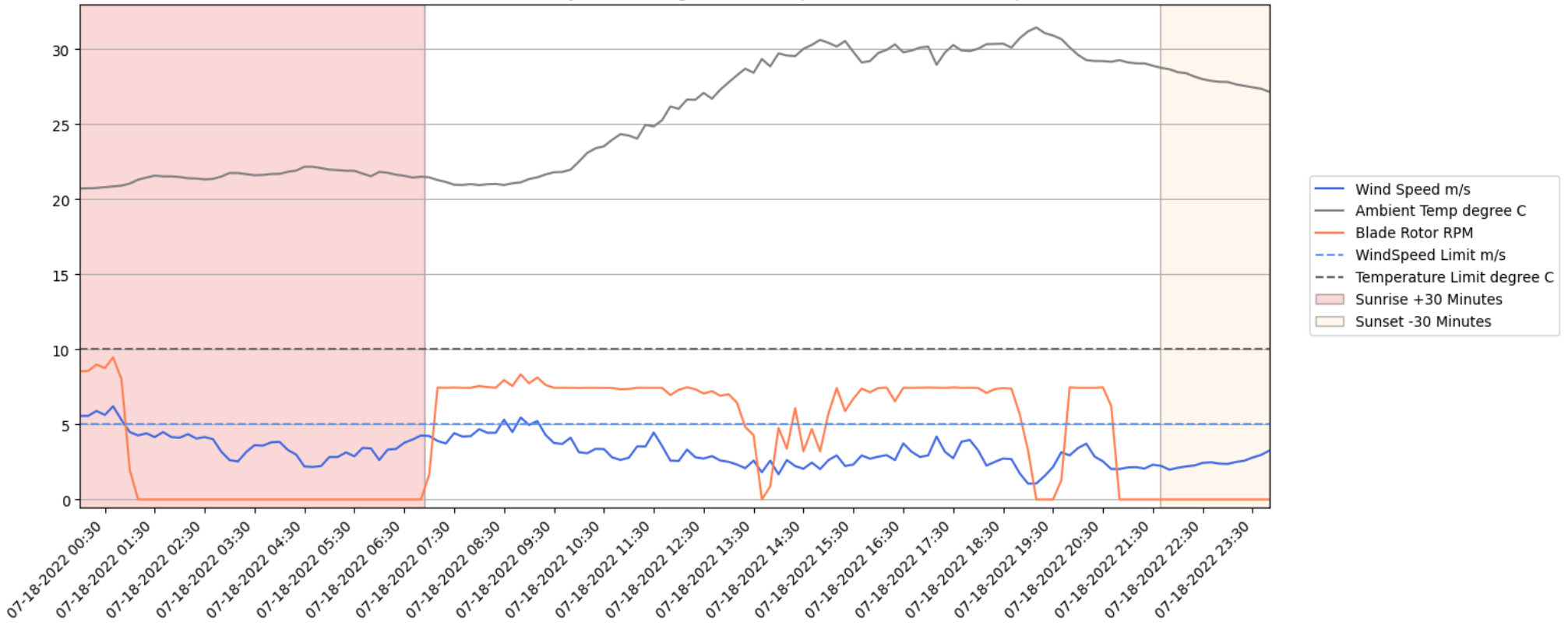
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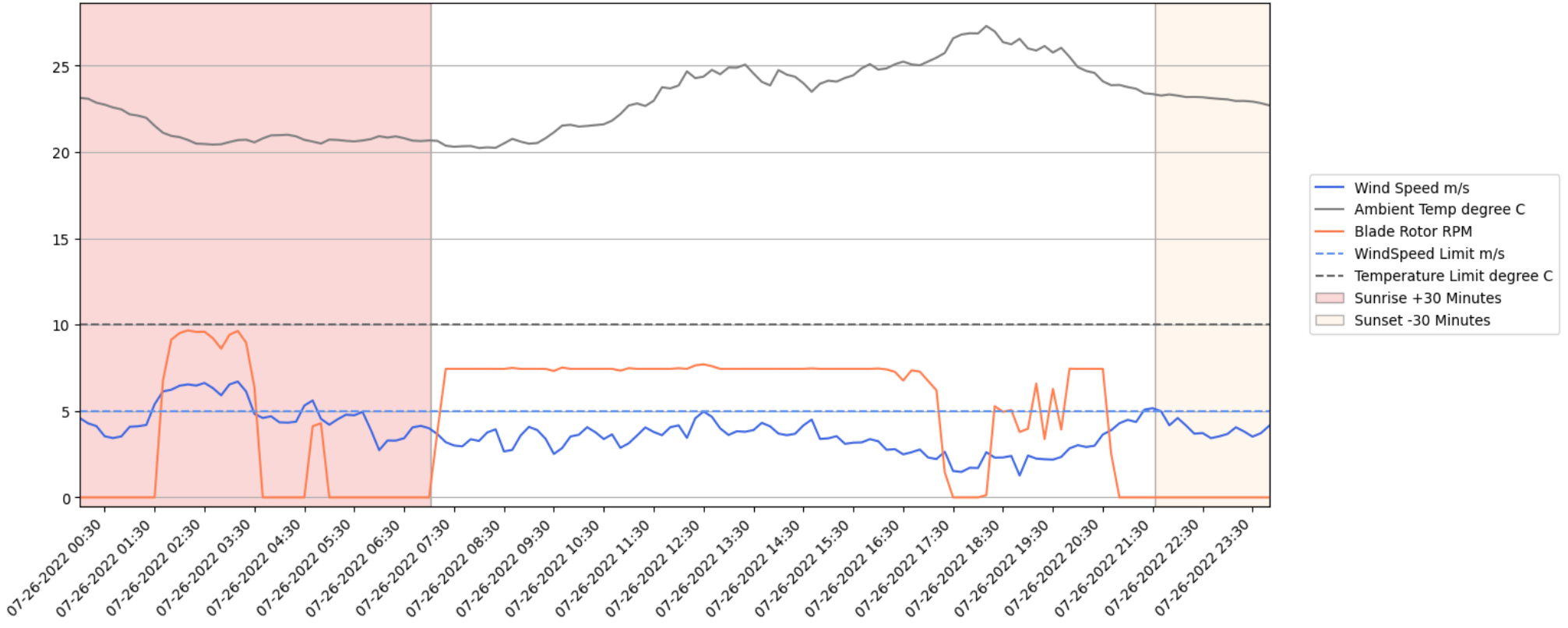
BTRG-WTG017

BTRG-WTG017, 08-01-2022, Fall Migration, ITP with high risk, wind speed limit 5 m/s and temperature limit 10 C

Legend:
- Wind Speed m/s
- Ambient Temp degree C
- Blade Rotor RPM
- WindSpeed Limit m/s
- Temperature Limit degree C
- Sunrise +30 Minutes
- Sunset -30 Minutes
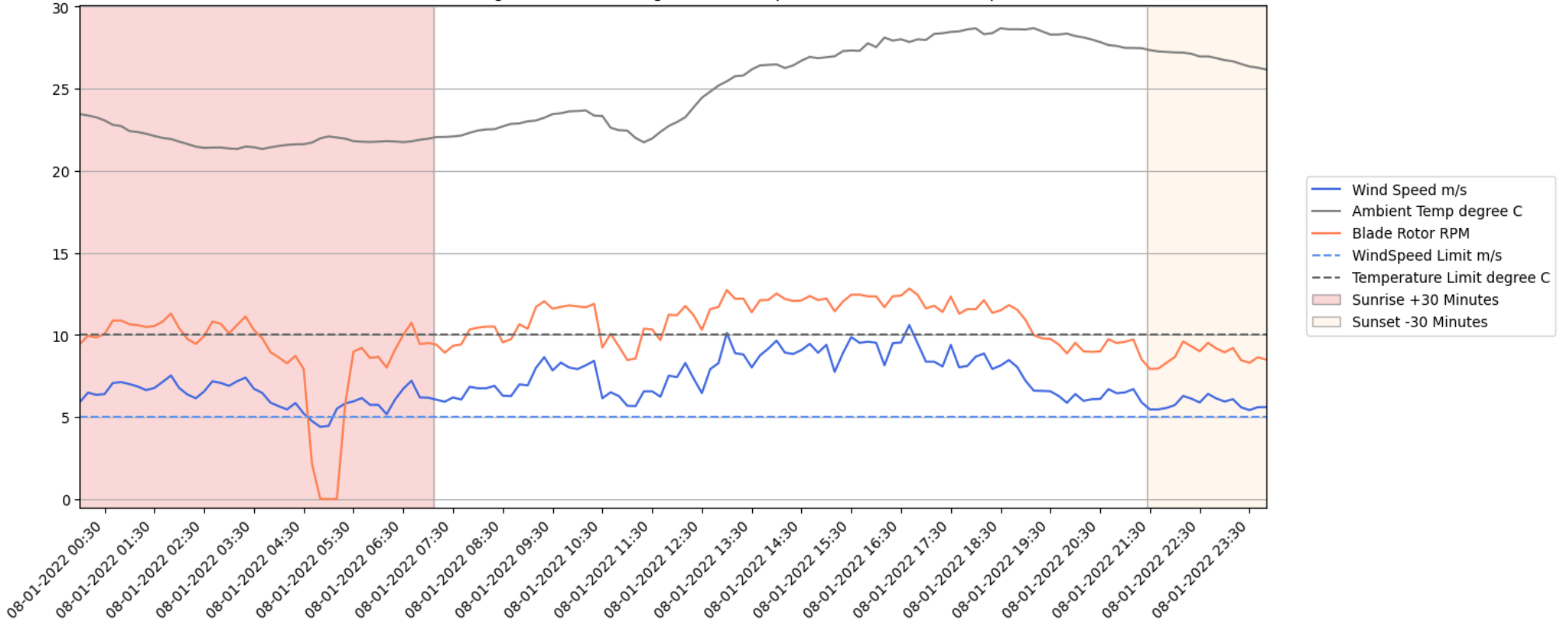
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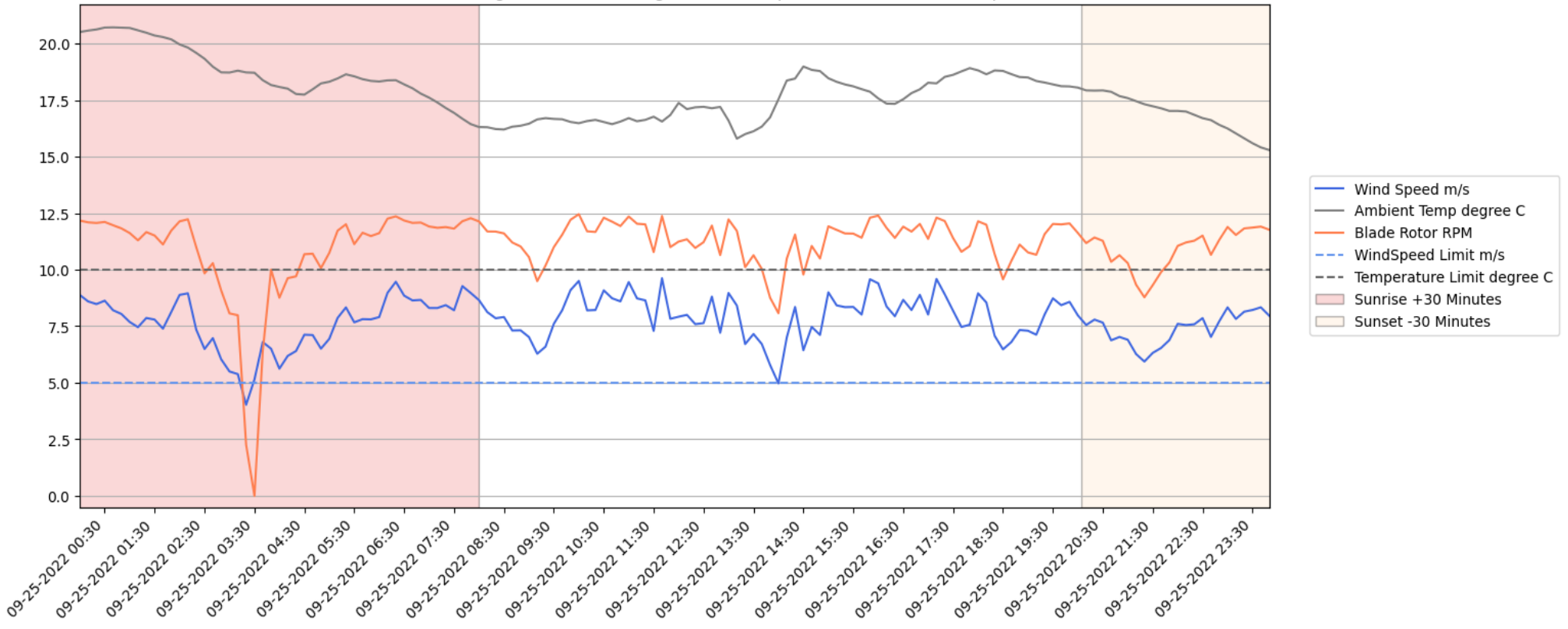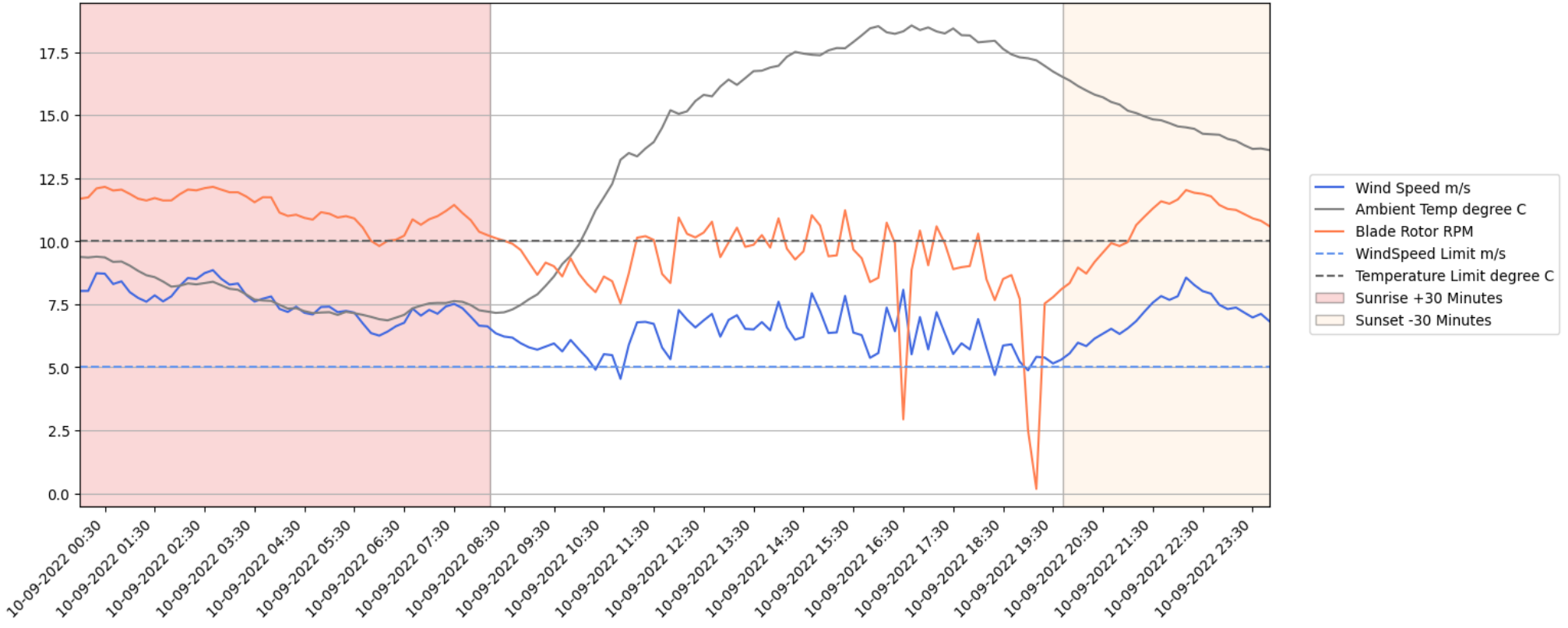
BTRG-WTG017

BTRG-WTG029

BTRG-WTG029, 04-06-2022, Spring Migration, ITP with high risk, wind speed limit 3 m/s and temperature limit 10 C

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- Ambient Temp degree C
- Blade Rotor RPM
- WindSpeed Limit m/s
- Temperature Limit degree C
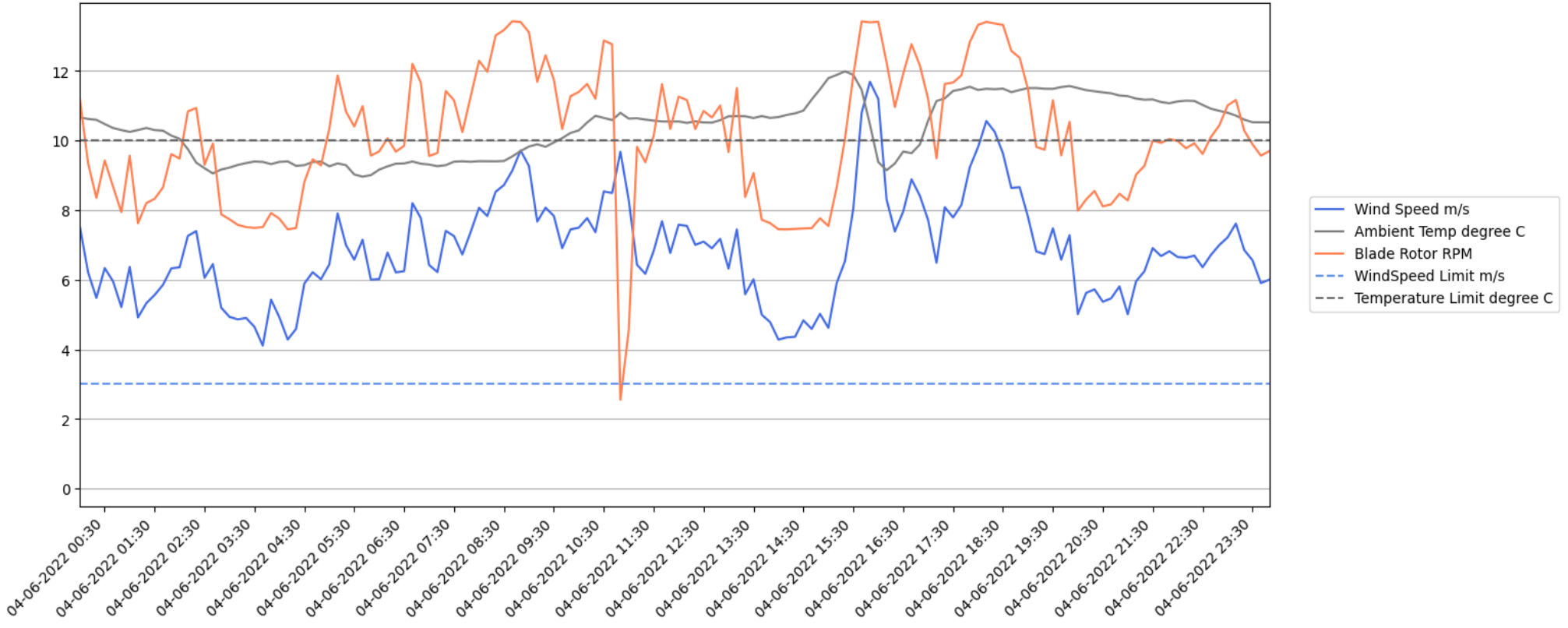
BTRG-WTG029

BTRG-WTG029, 05-13-2022, Spring Migration, ITP with high risk, wind speed limit 3 m/s and temperature limit 10 C

Legend:
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- Ambient Temp degree C
- Blade Rotor RPM
- WindSpeed Limit m/s
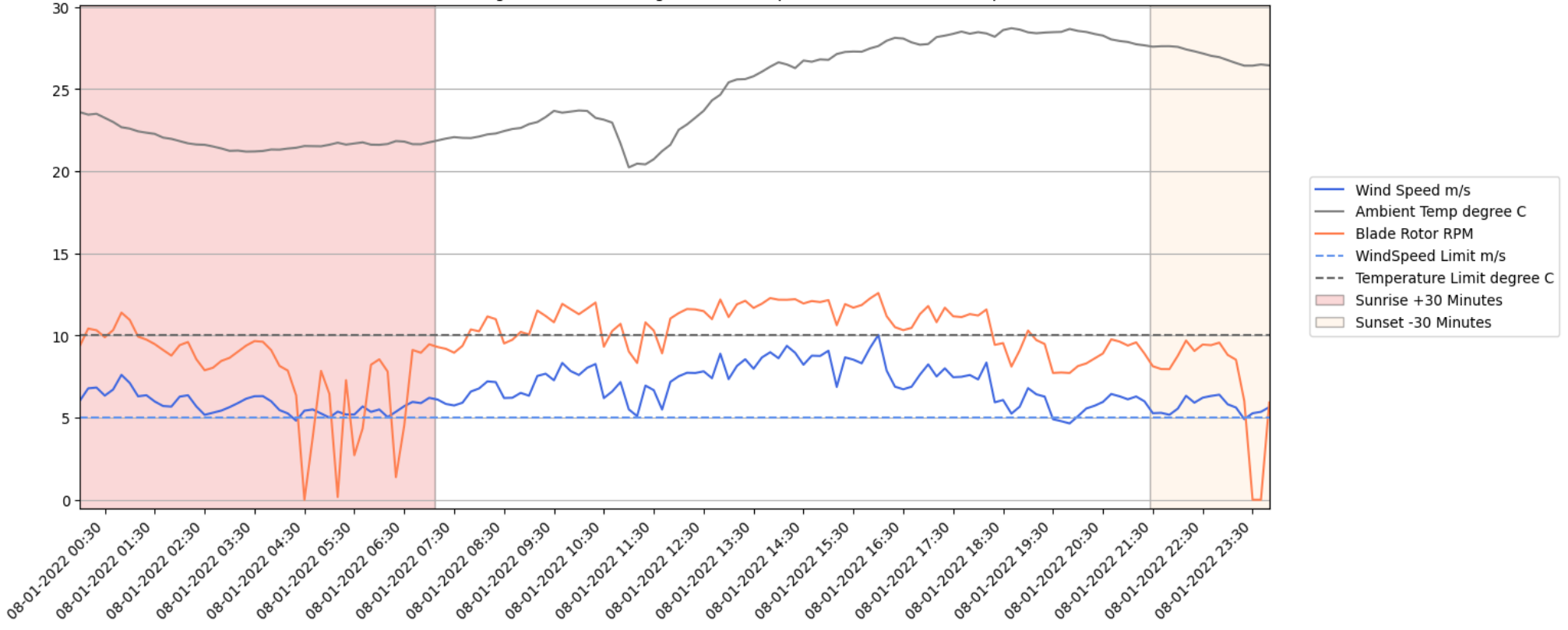- Temperature Limit degree C
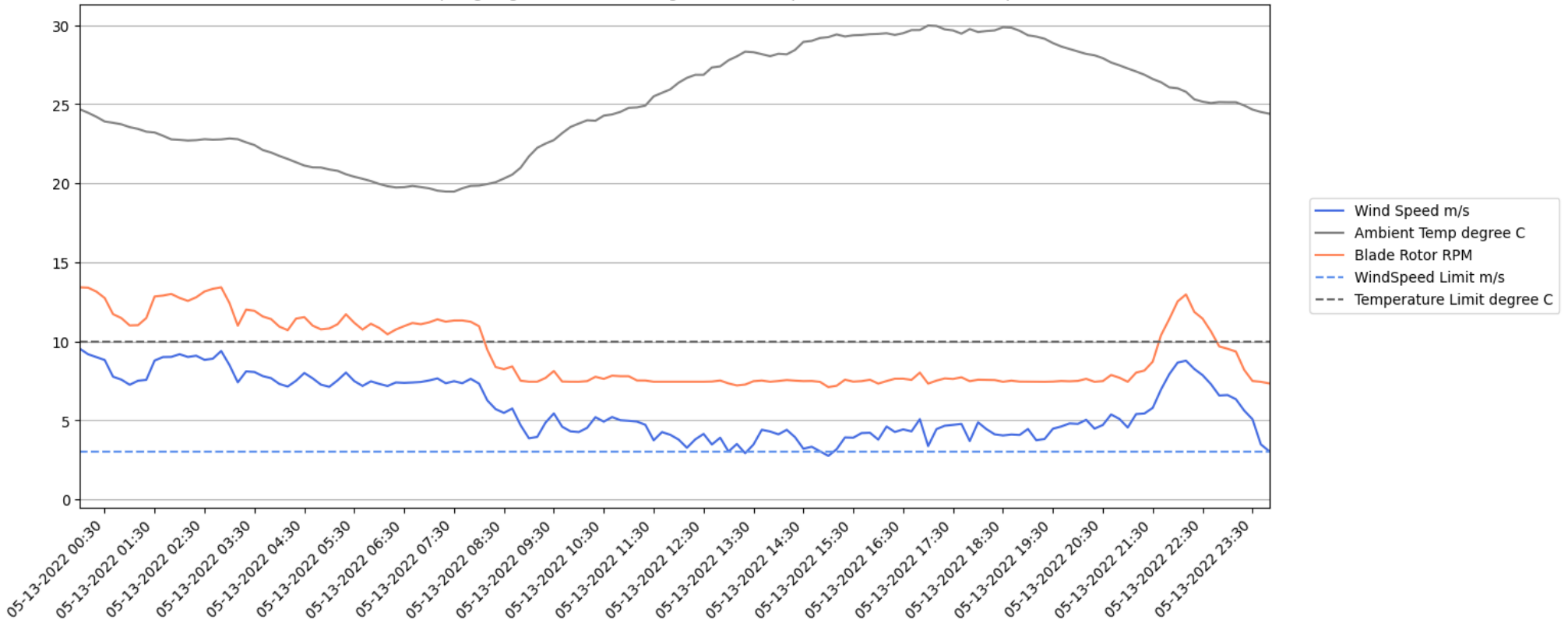
BTRG-WTG029

BTRG-WTG029

BTRG-WTG029, 07-18-2022, Summer Maternity, ITP with high risk, wind speed limit 5 m/s and temperature limit 10 C

BTRG-WTG029

BTRG-WTG029, 07-26-2022, Summer Maternity, ITP with high risk, wind speed limit 5 m/s and temperature limit 10 C
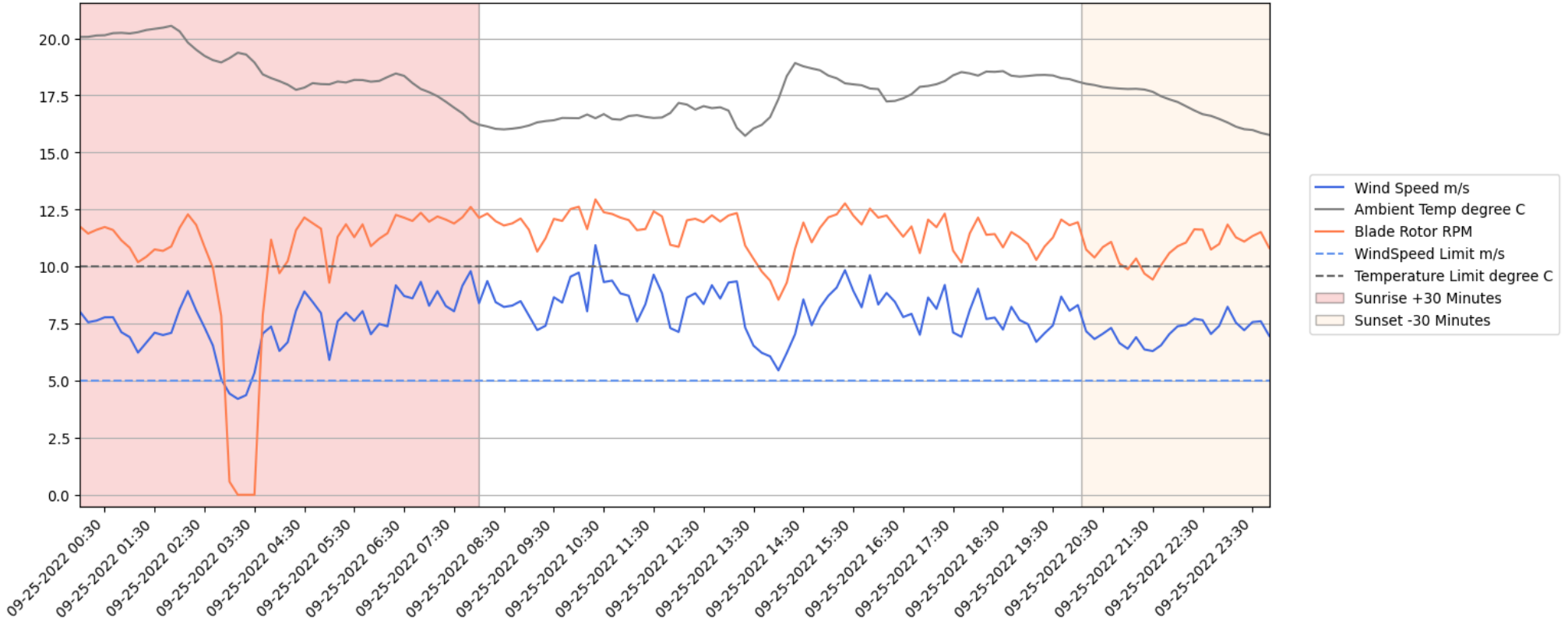
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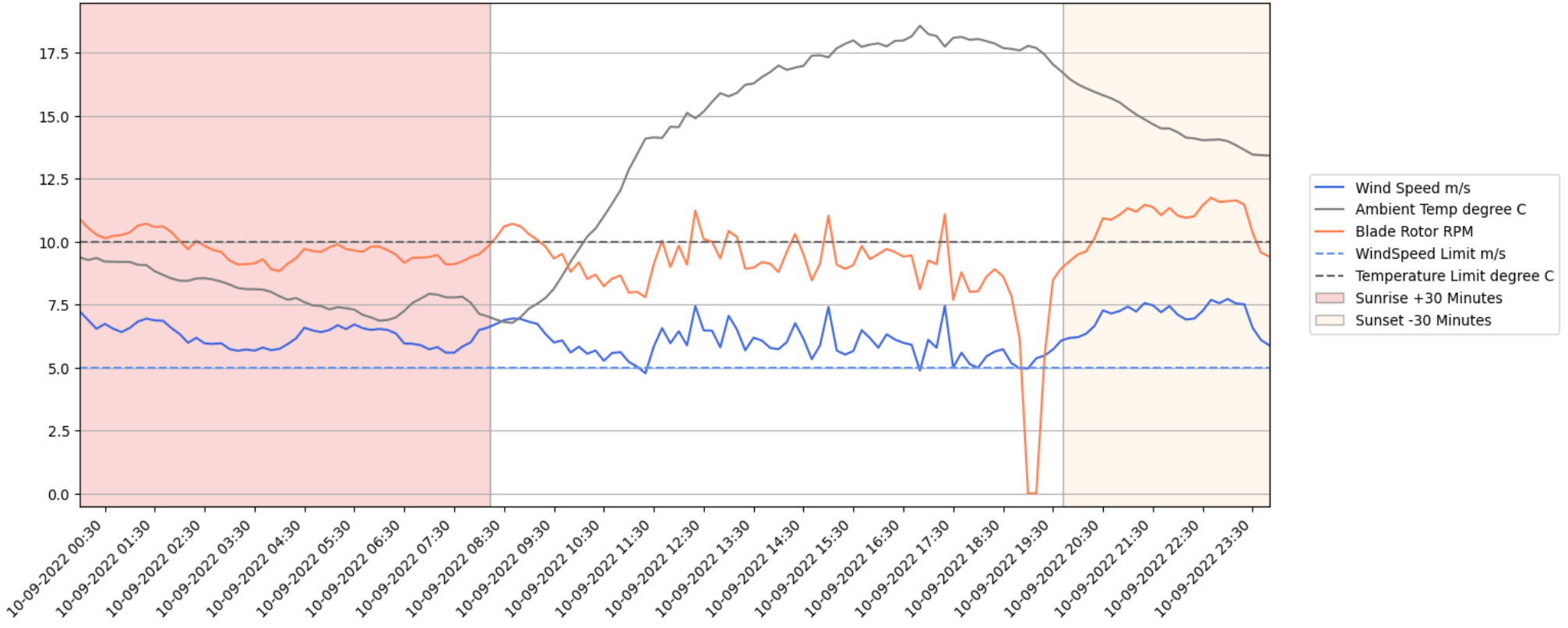
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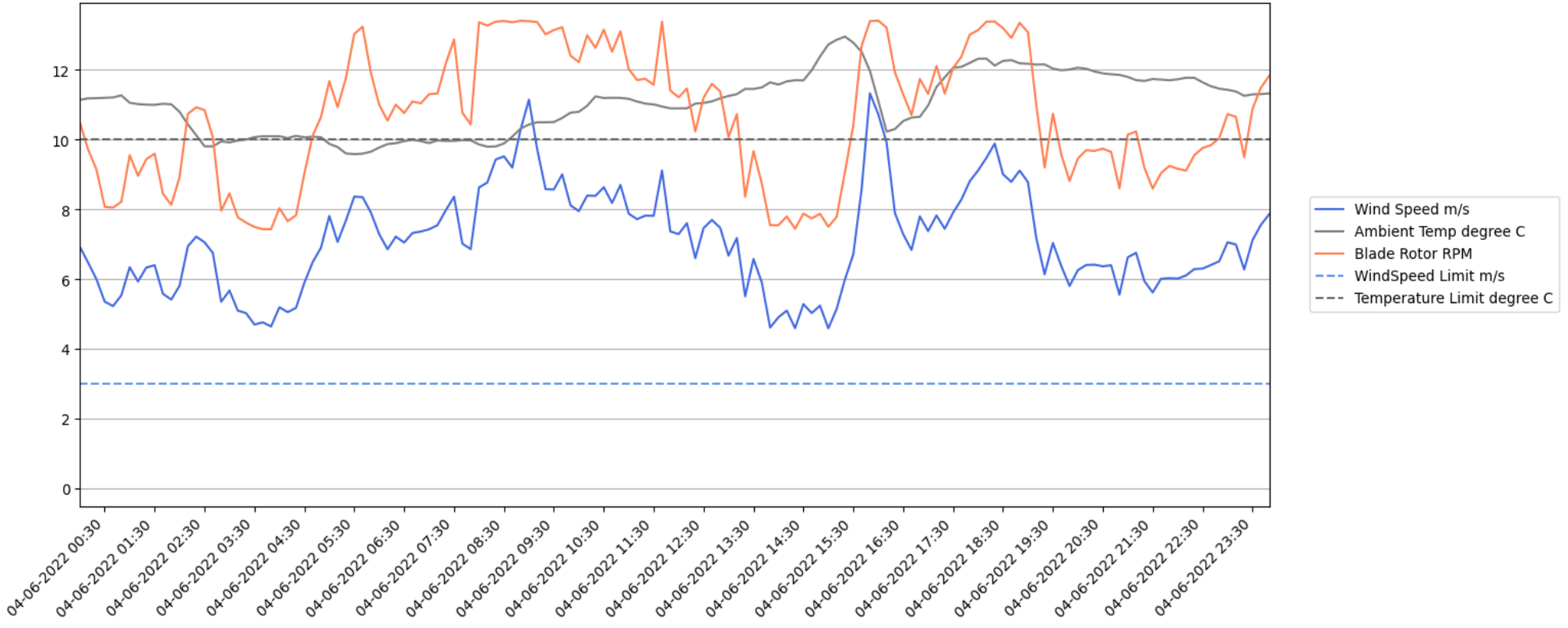
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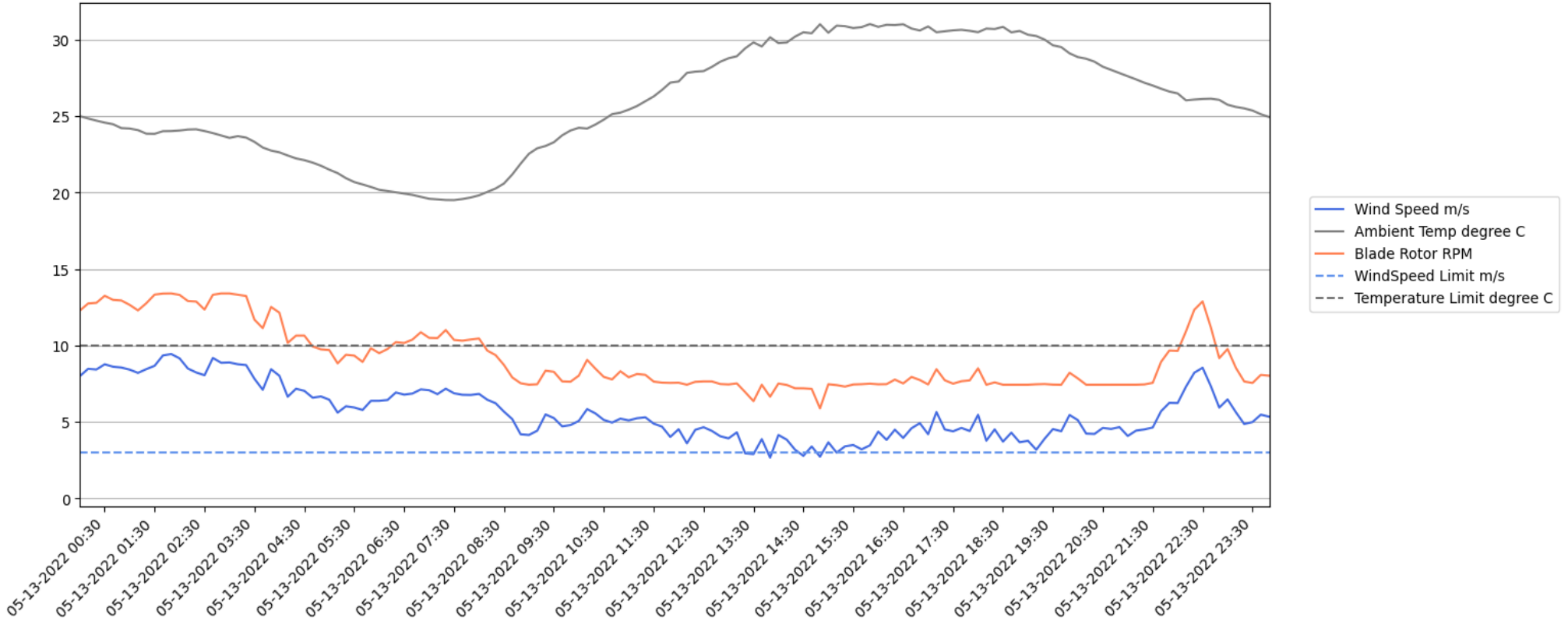BTRG-WTG029, 10-09-2022, Fall Migration, ITP with high risk, wind speed limit 5 m/s and temperature limit 10 C

BTRG-WTG032

BTRG-WTG032, 04-06-2022, Spring Migration, ITP with high risk, wind speed limit 3 m/s and temperature limit 10 C

BTRG-WTG032

BTRG-WTG032, 05-13-2022, Spring Migration, ITP with high risk, wind speed limit 3 m/s and temperature limit 10 C
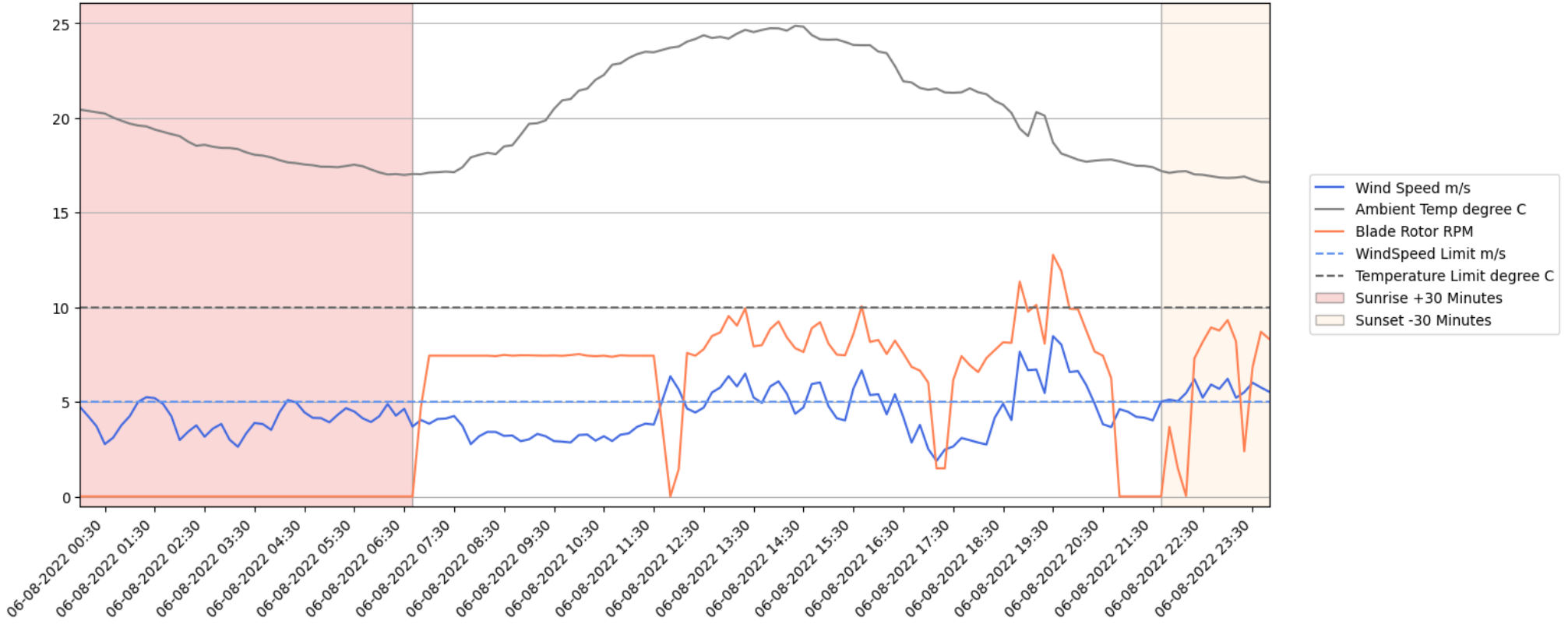
BTRG-WTG032

BTRG-WTG032, 06-08-2022, Summer Maternity, ITP with high risk, wind speed limit 5 m/s and temperature limit 10 C

BTRG-WTG032

BTRG-WTG032

BTRG-WTG032, 07-26-2022, Summer Maternity, ITP with high risk, wind speed limit 5 m/s and temperature limit 10 C

BTRG-WTG032

BTRG-WTG032

BTRG-WTG032, 09-25-2022, Fall Migration, ITP with high risk, wind speed limit 5 m/s and temperature limit 10 C

Legend:
- Wind Speed m/s
- Ambient Temp degree C
- Blade Rotor RPM
- WindSpeed Limit m/s
- Temperature Limit degree C
- Sunrise +30 Minutes
- Sunset -30 Minutes

BTRG-WTG032

BTRG-WTG032, 10-09-2022, Fall Migration, ITP with high risk, wind speed limit 5 m/s and temperature limit 10 C

BTRG-WTG050

BTRG-WTG050, 04-06-2022, Spring Migration, ITP with high risk, wind speed limit 3 m/s and temperature limit 10 C

BTRG-WTG050

BTRG-WTG050, 05-13-2022, Spring Migration, ITP with high risk, wind speed limit 3 m/s and temperature limit 10 C
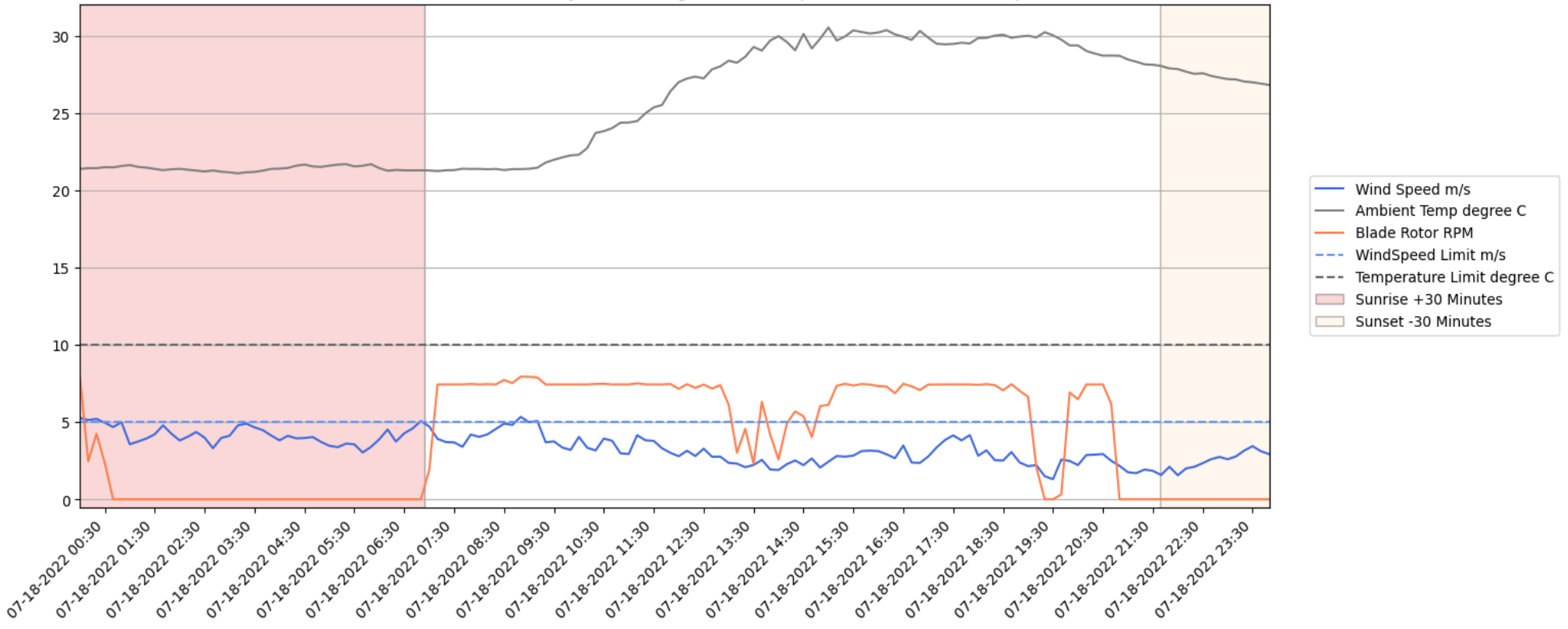
Legend:
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- Ambient Temp degree C
- Blade Rotor RPM
- WindSpeed Limit m/s
- Temperature Limit degree C

BTRG-WTG050

BTRG-WTG050

BTRG-WTG050, 07-18-2022, Summer Maternity, ITP with high risk, wind speed limit 5 m/s and temperature limit 10 C

Legend:
- Wind Speed m/s
- Ambient Temp degree C
- Blade Rotor RPM
- WindSpeed Limit m/s
- Temperature Limit degree C
- Sunrise +30 Minutes
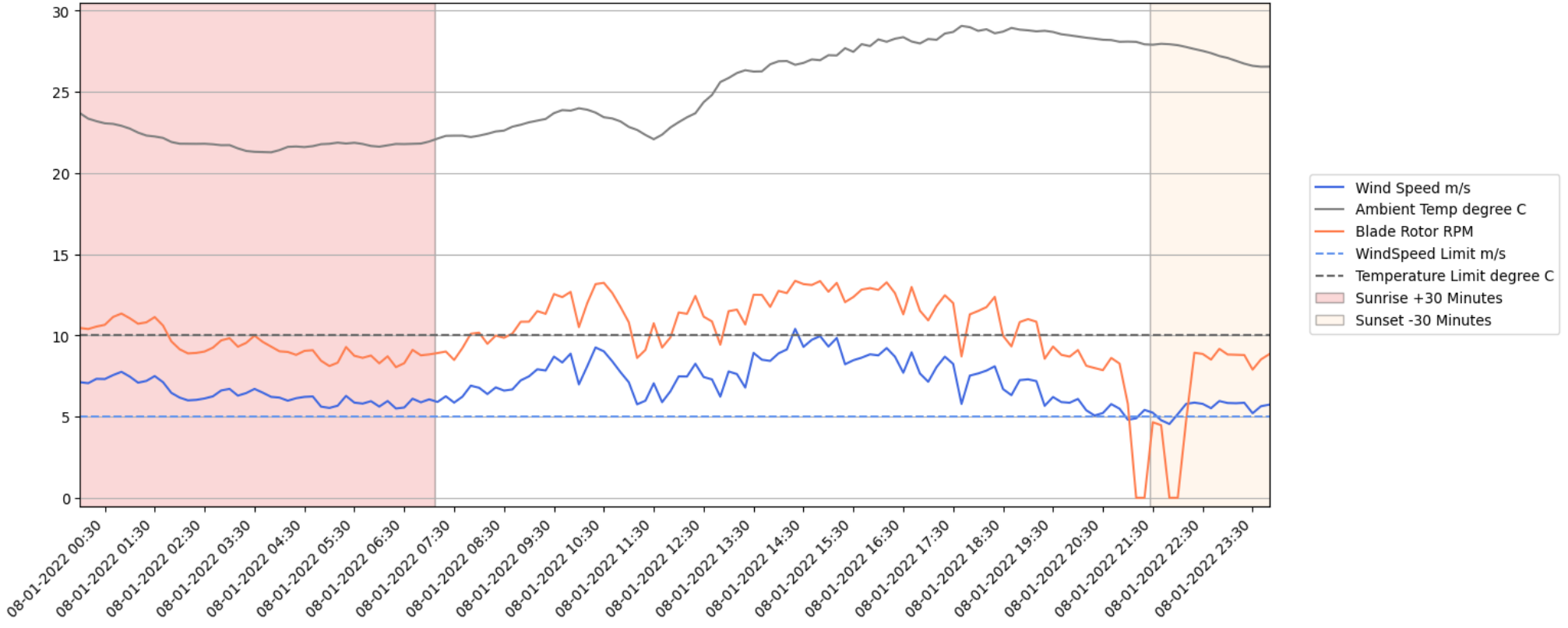- Sunset -30 Minutes

BTRG-WTG050

BTRG-WTG050, 07-26-2022, Summer Maternity, ITP with high risk, wind speed limit 5 m/s and temperature limit 10 C
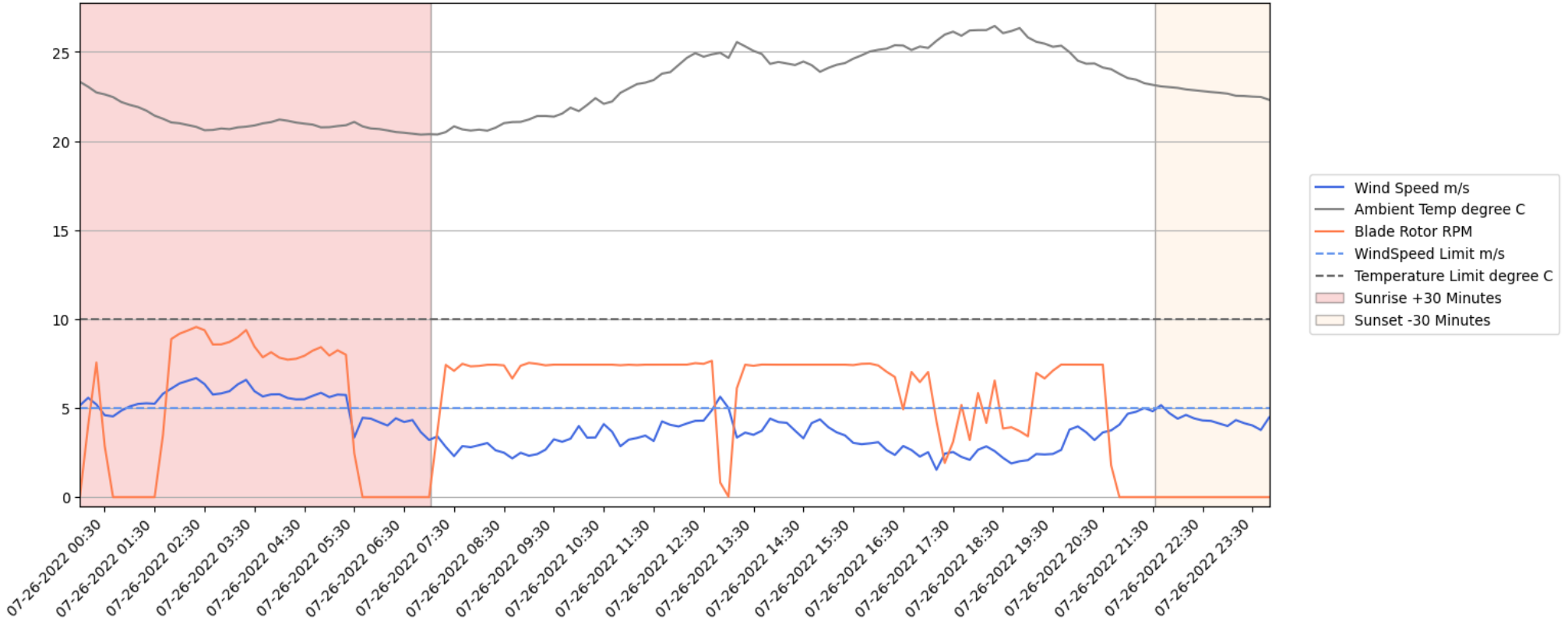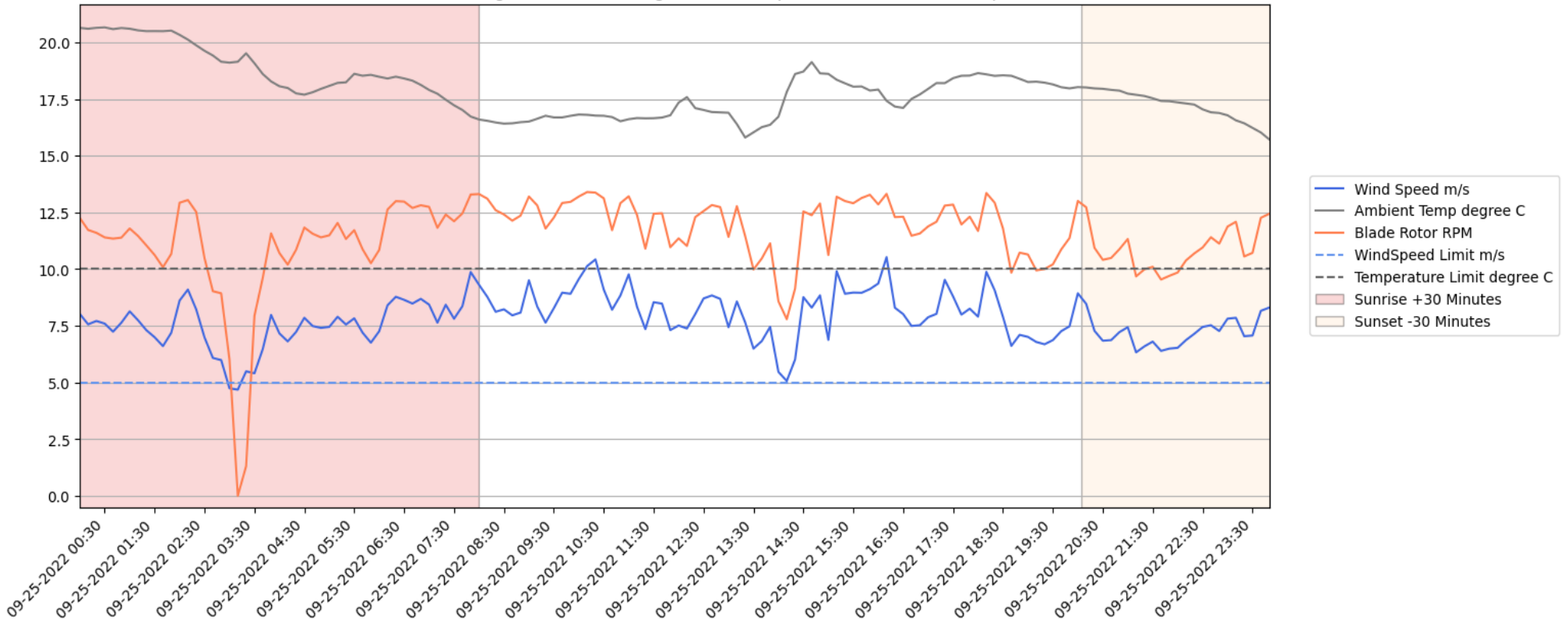
BTRG-WTG050

BTRG-WTG050, 08-01-2022, Fall Migration, ITP with high risk, wind speed limit 5 m/s and temperature limit 10 C

BTRG-WTG050

BTRG-WTG050, 09-25-2022, Fall Migration, ITP with high risk, wind speed limit 5 m/s and temperature limit 10 C

Legend:
- Wind Speed m/s
- Ambient Temp degree C
- Blade Rotor RPM
- WindSpeed Limit m/s
- Temperature Limit degree C
- Sunrise +30 Minutes
- Sunset -30 Minutes

BTRG-WTG050

BTRG-WTG050, 10-09-2022, Fall Migration, ITP with high risk, wind speed limit 5 m/s and temperature limit 10 C