TETRA TECH

MEMO

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Date:	May 30, 2025
Subject:	Wheatridge Renewable Energy Facility East Fatality Thresholds

1.0 Introduction

Construction and operation of Wheatridge Renewable Energy Facility East (WREFE), a 200-megawatt wind facility in Morrow County, Oregon, was approved by the Oregon Energy Facility Siting Council (EFSC or Council) in June 2024 (EFSC 2024). Operations are anticipated to commence in June 2025. In compliance with Site Certificate Condition PRE-FW-02, Wheatridge East Wind, LLC (Certificate Holder) consulted with the Oregon Department of Energy (ODOE) and Oregon Department of Fish and Wildlife (ODFW) to finalize the WREFE Wildlife Monitoring and Mitigation Plan (WMMP) as part of pre-operations compliance by updating the thresholds of concern:

> ***PRE-FW-02*** *Prior to operation, the certificate holder shall finalize the Wildlife Monitoring and Mitigation Plan (WMMP) provided in Attachment F-2 of the Final Order on Request for Amendment 1 of the Wheatridge Renewable Energy Facility II Site Certificate (November 2020), by updating the thresholds of concern in Section 3.6 of the WMMP in consultation with the Department and ODFW. The WMMP may be amended from time to time by agreement of the certificate holder and the Council. Such amendments may be made without amendment of the site certificate. The Council authorizes the Department to agree to amendments to this plan. The Department shall notify the Council of all amendments, and the Council retains the authority to approve, reject, or modify any amendment of the WMMP agreed to by the Department.*

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The Certificate Holder met via video conference with representatives from ODFW on April 9, 2025, and again with ODFW and ODOE on May 8, 2025, to discuss potential fatality threshold updates as well as alternative approaches to continued monitoring and mitigation, should the thresholds be exceeded, that maximize species and taxa conservation. ODFW ultimately indicated they needed additional time to review available region-wide data to support a meaningful, data-driven update to the fatality thresholds.

Thus, the Certificate Holder hereby submits a revised WMMP for pre-operations compliance that includes the previously approved (i.e., historic) fatality thresholds. However, the Certificate Holder has prepared this memo to summarize the data analysis conducted in support of fatality threshold revisions to assist ODFW with their ongoing analysis. This memo also presents for consideration alternative additional monitoring and mitigation approaches that may be pursued following the completion of the first year of fatality monitoring at WREFE, if appropriate, through an amendment to the WMMP.

2.0 Science-Based Fatality Thresholds

EFSC adopted the concept of "thresholds of concern" for raptors, raptor species of special concern, grassland species, and state sensitive avian species in the Final Order on the Application for the Klondike III Wind Project (June 30, 2006; EFSC 2006a) and for bats in the Final Order on the Application for the Biglow Canyon Wind Farm (June 30, 2006; EFSC 2006b). In developing these thresholds, ODOE relied on monitoring results from the Stateline Wind Project (Erickson et al. 2004). Therefore, although the threshold numbers served as a benchmark for deciding whether EFSC should be concerned about observed fatality rates, the thresholds "have a very limited scientific basis" and no relationship to the susceptibility to project impacts of the populations of interest (EFSC 2006a, 2006b). When adopting these thresholds, EFSC acknowledged that exceeding a threshold by itself would not be a scientific indicator that operation of the facility would result in range-wide population-level declines of any of the species affected. Post-construction fatality monitoring studies at wind projects in Oregon are standard conditions of EFSC project approval; as a result, fatality data collected and analyzed with the latest state-of-the-science methods should be used as the basis for identifying updated, science-based fatality thresholds.

During pre-operations agency coordination, the Certificate Holder proposed that the 75th percentile of fatality rates for Oregon EFSC projects with fatality studies since 2018 (the year that the current standard estimation software GenEst [Dalthorp et al. 2018] became available) be adopted as the updated fatality thresholds of concern in WREFE's updated WMMP (see below for more details). The Certificate Holder suggests that the 75th percentile serves as a point beyond which mortality associated with a given wind facility is likely to have exceeded the expected level of impact, and that additional coordination with ODOE and ODFW is warranted to determine the need for mitigation. Although this method of defining thresholds is similar to the historic thresholds in that they are not tied to a measure of population-level impacts, the advantage is that the percentile method accommodates the inclusion of additional regional mortality study data as they become available,

and enables comparison of a specific project's mortality to real-time mortality trends within the region. In other words, the thresholds themselves are living, as they can continually be informed with future project data.

While data are available within the wider Columbia Plateau Ecoregion (CPE) from prior to 2018, methods used to produce those fatality estimates are outdated to varying degrees; as such, the majority of those studies likely represent underestimates of actual mortality (Rabie et al. 2021). The latest region-wide summary of fatality data (Jansen 2023) acknowledges flaws in these data and the associated protocols, including the following limitations:

- Many fatality estimates were for studies spanning less than a year; therefore, these values are not true annual fatality estimates and would almost certainly be higher if they captured a full year of study.
- Bias correction trial methods were unclear, and/or bias correction methods in older studies varied among projects. Historically, this has led to fatality estimates being biased low. For example, small birds were often used as surrogates for bats in carcass persistence trials. Current literature indicates that bat fatalities typically persist for a shorter period than small birds; thus, these studies likely underestimated bat fatality rates.
- The statistical estimators used in many early studies had outdated assumptions around detection probability, creating estimation bias. Furthermore, they handled uncertainty associated with carcass counts less effectively than the current state-of-the-science estimator used for understanding generalized mortality (GenEst; Rabie et al. 2021). The Shoenfeld estimator (used for the majority of the studies in the CPE; e.g., see summary of estimator use in Oregon studies in Stantec 2025) is particularly prone to producing fatality estimates which are biased low (Rabie et al. 2021).
- Most studies did not employ an area correction factor to adjust for the proportion of carcasses that fell outside of the searched area (Johnson and Erickson 2011).

In contrast, studies from 2018 onward employed search methods that have evolved over time to maximize searcher efficiency, have more appropriate quantification of bias (e.g., using bat carcasses to correct for bias), use statistical models and empirical data to account for the proportion of carcasses which fall outside of searched areas, and generally utilize GenEst (Dalthorp et al. 2018) which introduces limited additional bias in the estimation process based on the estimator's underlying assumptions. The improvements in the accuracy of fatality estimates using current methods is possible to quantify by re-analyzing historic data using modern methods (where robust data are available), and may be an avenue worthy of investigation by ODFW.

The Certificate Holder performed an analysis of estimated fatality rates from nine studies conducted between 2018 and 2025, available from ODOE and/or from facilities in Oregon operated by the same parent company as the Certificate Holder:

- Wheatridge Renewable Energy Facility I (WREF I; Years 1 and 2; Tetra Tech 2022a, 2024a),
- WREF II (Years 1 and 2; Tetra Tech 2022b, 2024b),

- Montague Wind Power Project (Years 1 and 2; Chatfield and Martin 2021, Chatfield et al. 2022),
- Golden Hills Wind Project (Year 2; Martin and Sharick 2024),
- Vansycle II Wind Project (Tetra Tech 2024c), and
- Tucannon River (as cited in Jansen 2023).

Fatality rates are presented for bats and raptors. The mean and median fatality rates for bats in these studies were below the current threshold, whereas the mean and median fatality rates for raptors were above the current threshold (Table 1).

Table 1. Annual Fatality Estimates from 2018 Onward and Historic Thresholds of Concern

Species Group	Median Fatalities/MW	Mean Fatalities/MW	75th Percentile (Third Quartile; Fatalities/MW)	Historic Threshold of Concern[1] (Fatalities/MW)
Raptors (All eagles, hawks, falcons and owls, including burrowing owls.)	0.15[2]	0.25[2]	0.33[2]	0.09
Bats	1.95[3]	2.38[3]	3.52[3]	2.50

1. EFSC adopted the concept of "thresholds of concern" for raptors, grassland species, and state sensitive avian species in the Final Order on the Application for the Klondike III Wind Project (June 30, 2006) and for bats in the Final Order on the Application for the Biglow Canyon Wind Farm (June 30, 2006). The exceeding of a threshold, by itself, would not be a scientific indicator that operation of the Facility would result in range-wide population-level declines of any of the species affected (EFSC 2006a, 2006b).

2. Based on data from 9 studies with 4 reported raptor fatality rates.

3. Based on data from 9 studies with 9 reported bat fatality rates.

The Certificate Holder suggests that utilizing the 75th percentile of fatality estimates from 2018 studies and onward as the updated fatality threshold is an appropriate approach to threshold evaluation because the 75th percentile represents the third quartile of the dataset; this third quartile forms a key part of the Interquartile Range (IQR), a standard method for identifying statistical outliers (Ott and Longnecker 2010). Fatality estimates that fall above this 75th percentile-derived threshold represent outlier values (i.e., higher than the mean) warranting additional review including additional consultation regarding mitigation. Using metrics such as the median or mean of all available data (e.g., as summarized in Jansen 2023), including data collected and analyzed using outdated methods, would result in most current or future projects tripping the requirement for additional review for mitigation. The situation of most projects tripping the requirement is inconsistent with the concept of "concern" the threshold is intended to identify. Furthermore, as described above, neither the historic nor the proposed threshold is tied to population-level impacts, partially because the bat and raptor thresholds are for species groups (not individual species) and partially because total population size of some species detected as fatalities is unknown (e.g., because population estimates are lacking in the case of bats and because the unknown origin of some individuals found as fatalities complicates the definition of "population"). Requiring reviews

of half or more of wind projects for the need for additional mitigation in the absence of an indication of population-level impacts is not warranted.

In the WREFE Final Order (ODOE 2024), the EFSC compared historic fatality thresholds to region- and nation-wide fatality rates and noted that the historic thresholds allow for higher raptor and bat fatality rates than would be expected for a project in the CPE:

> *While data for all thresholds of concern imposed by the Council are not available, the data suggest that the current thresholds of concern allow for significantly higher rates of fatality for raptors and bats than would be expected at a wind facility in the Columbia Plateau ecoregion. Notably, the median fatality rate for bats in fatality studies included in the WEST study was 0.77 fatalities per MW/year which is only 30 percent of the 2.5 fatalities/MW/year allowed under the current threshold. Accordingly, The Council finds that the thresholds must be amended, and directs the Department, in consultation with ODFW, to determine appropriate rates based on currently available data, prior to approval of the final WMMP.*

Based on the Certificate Holder's review of available data from studies that used state-of-the-science monitoring and analysis methods (i.e., that more accurately estimate true mortality), the historic threshold for raptors is lower than the fatality rate expected for recent wind facilities in the CPE (i.e., median[1] of 0.15 fatalities/MW/year for studies from 2018-2025 compared to historic threshold of 0.09 fatalities/MW/year) whereas the historic threshold for bats is slightly higher than the fatality rate expected for recent wind facilities in the CPE (i.e., median of 1.95 fatalities/MW/year for studies from 2018-2025 compared to the historic threshold of 2.50 fatalities/MW/year). Therefore, even if updated thresholds were to rely on a metric such as median rather than the 75th percentile to identify outliers, current fatality study data suggest that the threshold would be increased for raptors and only slightly decreased for bats.

3.0 Adaptive Management and Alternative Mitigation

In addition to updating the fatality thresholds to be based on current, robust regional data, the Certificate Holder discussed approaches to adaptive management and alternative mitigation options with ODOE and ODFW during pre-operations coordination. These approaches have the opportunity to directly contribute to positive conservation outcomes for the species groups or individual species disproportionately affected by WREFE (if indicated by monitoring), while providing a greater level of financial predictability to the Certificate Holder. Two years of post-construction fatality monitoring are typically required for wind facilities approved by EFSC (e.g., monitoring in Year 1 and Year 5); these data have limited use beyond informing the potential need for mitigation (thresholds of concern exceedance). The Certificate Holder discussed with ODFW and ODOE mitigation and/or adaptive management options that could be implemented in lieu of a

[1] The distribution of fatality rates for all species is highly skewed, so the median is a better indicator of the center of the distribution.

second year of monitoring to more effectively contribute to species and taxa conservation than fatality monitoring alone (Figure 1).

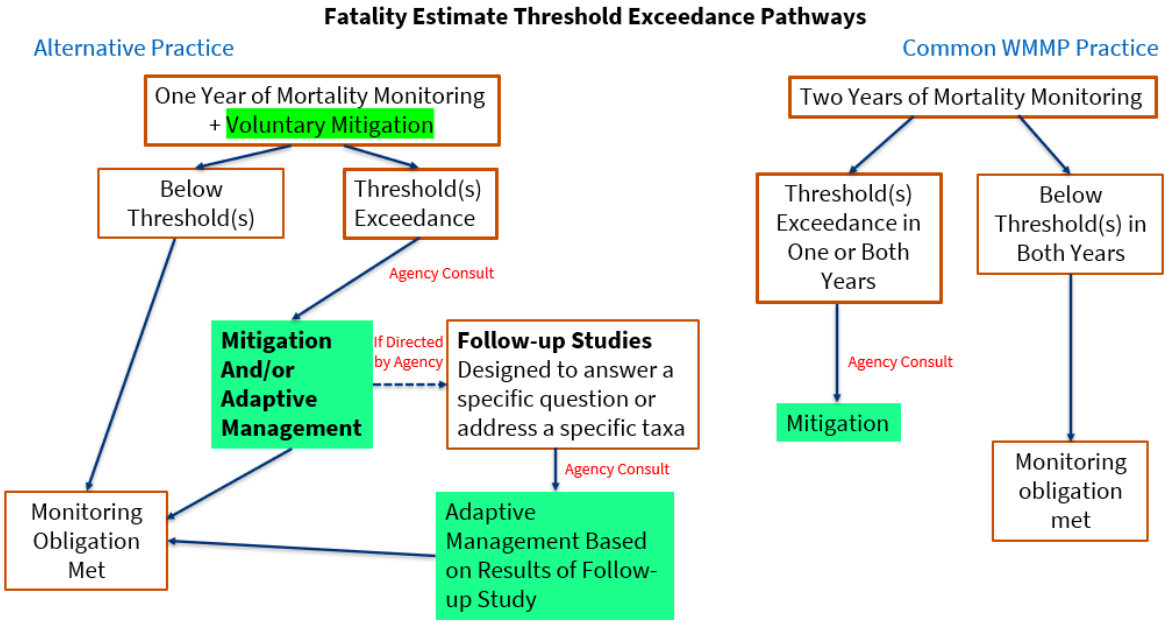

Figure 1. Fatality Estimate Threshold Exceedance Pathways

The Certificate Holder further identified examples of effective mitigation and/or adaptive management that could be implemented if a threshold of concern is exceeded based on one year of monitoring. This approach is based on the Certificate Holder committing to a dollar amount that would offset an impact through a more direct contribution to the species pathway rather than a second year of mortality data collection which may or may not provide a benefit to the species. Mitigation/adaptive management options include the potential for some level of turbine curtailment (if the target taxa is bats), habitat-based mitigation including augmenting existing WREFE habitat mitigation work, and monetary contributions to research efforts or conservation organizations (Figure 2). A second year of fatality monitoring would not be performed under this alternate approach, regardless of threshold exceedance. However, follow-up studies may be performed, if recommended by ODFW during consultation to answer a specific question or address a specific taxa.

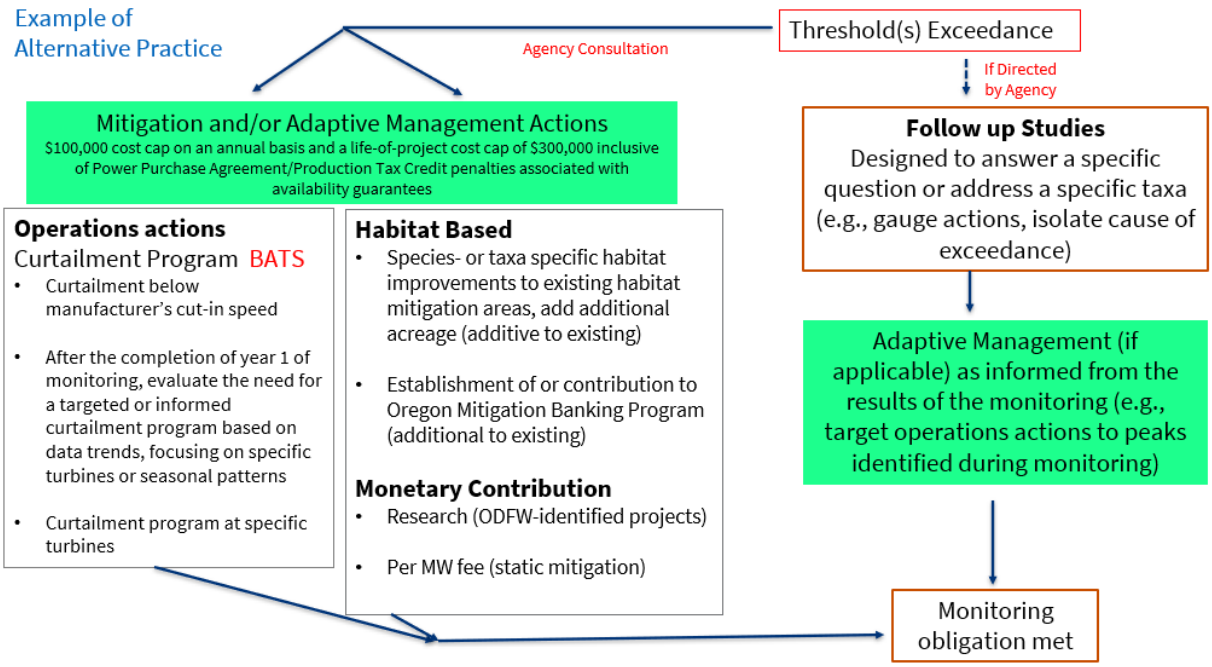

Figure 2. Example Adaptive Management and Mitigation Alternatives

The WMMP hereby submitted for pre-operations compliance commits to two years of post-construction fatality monitoring (i.e., in Years 1 and 5, consistent with the previously approved WMMP for WREF II). The Certificate Holder looks forward to working with ODFW and ODOE to identify opportunities for more effective species and taxa conservation following the first year of monitoring, if a threshold is exceeded, and continuing to discuss the appropriate science-based fatality thresholds that would trigger such mitigation.

4.0 References

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