HERPETOLOGIC

26 March 2025

Attn: Jayden O'Brien
Senior Environmental Advisor – Iron Bridge Studies
Fortescue Limited

Dear Jayden,

Please find below a memo detailing a technical review of the GHD (2025) *Detailed bat habitat assessment* report for Fortescue Limited's (Fortescue) North Star Extension (NSE).

Overall the GHD (2025) report describes and defines the significance of 26 caves for ghost bat and Pilbara leaf-nosed bat within the NSE development envelope, utilising a proposed revised classification scheme for ghost bat roosts by Supersensory Technologies (2025; Appendix A of GHD (2025)). A summary of the review of the revised classification scheme and subsequent classification of the 26 caves within the NSE development envelope is provided herein.

Ghost Bat

While the existing Bat Call (2021b) roost classification system has limitations, particularly regarding the confidence of category assignment based on often limited information (pertaining to single visits or limited datasets such as ultrasonic recordings only), the proposed revised classification system presented by Supersensory Technologies (2025) provides an explicit set of criteria for classification with a greater confidence. This is achieved by a consistent consideration across five key variables with clearly defined criterion, comprising detection of presence, diurnal occupancy rate, colony size, size and structure of roost, and occurrence of breeding. With each of these variables, a ranking system can be utilised to determine an overall score, and allocate an appropriate category, for caves using easily obtainable data.

Based on an assessment of the 26 roosts within the NSE development envelope against the Supersensory Technologies (2025) revised classification scheme using available data presented in GHD (2025) and Supersensory Technologies (2025), 25 cave classifications consistently align with appropriate categories presented by Bat Call WA (2025b). This includes (Table 8 of GHD (2025)):

- two caves (Heritage Cave and Mandagoora Cave 3) meeting some criteria and classified as possible Category 3 roosts (diurnal roost with occasional occupancy), but meeting criteria for Category 4 roosts (nocturnal roost with occasional usage/ nocturnal refuge) criteria.
- three caves (Caves 1a, 2, 11, and 33) meeting criteria and classified as Category 4 roosts.
- 19 caves (Mandagoora Caves 1 and 2, Caves 3, 4, 5, 6, 7, 8, 10, 12, 13a, 14, 15, 16, 17, 21, 22, 23, and 32) meeting some criteria and classified as possible Category 4 roosts.

Of the 26 caves, one (Python Cave) potentially differs in the classification between the two classification schemes. Following the Supersensory Technologies (2025) classification scheme, the cave is classified as a Category 3 roost; however, following the Bat Call WA (2021b) classification scheme, the cave may be considered a Category 2 roost. This is largely attributed to the consideration and definition of 'regular occupancy' which is a key criterion under the Bat Call WA (2021b) classification scheme. Bat Call WA (2021b) refers to occupancy rates of 25–75% for up to five (rarely 20 or more) individuals, but with bats presence not continuous over long periods for Category 2 roosts, whereas occupancy rates for Category 3 roosts are not defined, with only reference to bats being present occasionally or rarely. The limitations of criteria (i.e. few or broad criterion, or inconsistent considerations between categories) of the Bat Call WA (2021b) classification scheme make it difficult to assign a category to Python Cave with high confidence based on the limited classification criteria and available data for the cave.

Noting that diurnal roosting of between one and three individuals was recorded on 40% (37 of 92 nights) of the sampling period, Supersensory Technologies (2025) highlights that diurnal occupancy was relatively regular, but not always consistent across consecutive days. While this highlights the need for further definition of occupancy rates and how they can best be used to inform cave classification, the combined consideration of the number of individuals observed as well as the occupancy rates provide greater support for the Supersensory Technologies (2025), and subsequent GHD (2025) classification of Python Cave as a Category 3 roost.

Based on the available data for all 26 caves within the NSE development envelope, the Supersensory Technologies (2025) classification scheme appears to provide a clearly defined delineation between cave categories with greater support and confidence.

Ghost Bat Roost Significance

As part of the Supersensory Technologies (2025) revised classification scheme, a revised habitat significance classification is proposed for each roost category (Table 1). For the purposes of significant species (i.e. those listed as threatened under the federal *Environmental Protection and Biodiversity Conservation Act 1999* or Western Australian *Biodiversity Conservation Act 2016*), classification of habitats is primarily focused on 'critical' and non-critical 'key' or supporting habitat. Department of the Environment (2013) broadly defines critical habitat as habitats critical to the survival of a species, in that they are necessary for activities such as breeding, roosting, foraging or dispersal, and the long-term persistence of a species. Similarly, in a draft policy statement released for stakeholder consultation in January 2024, DCCEEW (2023) defined critical habitat as 'habitat that is critical to the survival of a species and to maintaining their persistence in the environment' with 'habitat outside of critical habitats that is necessary to ensure the species persistence and enable its recovery' referred as key habitat. Despite the differing terminology, the broad classification of habitats for ghost bat being critical (i.e. maternity/ diurnal roosts) or key/ supporting (i.e. nocturnal roosts, foraging and dispersal habitats) is broadly applied within environmental impact assessment and environmental approvals.

While the Supersensory Technologies (2025) proposed revised classification of habitat significance for each roost category provides an unambiguous separation between roost categories (i.e. no category can be either critical or non-critical based on other variables beyond the criterion for classification), it also results in four distinct classifications as opposed to the existing critical or key/ supporting. Where the roost category of a cave can be accurately classified, this provides a value-driven classification of the relative importance of each category to the species. Although this classification of significance may appear to reduce the significance of a roost (i.e. Category 3 referred to as low-priority as opposed to critical following Bat Call WA (2021b)), this may represent an overclassification of some roosts at times. Whereas a more refined classification of significance is likely to result in the implementation of robust managements strategies to ensure the roosts of greatest value to the species are protected to support the long-term persistence of the species at a local and/or regional scale. While the revised classifications can be used to determine a refined significance of habitats within an area, how they broadly fall within critical and key habitat classifications would be beneficial in providing a higher level classification of roosts in a broader context.

It should be noted that there are still some uncertainties around the utilisation and importance of different roost categories to ghost bat. While those clearly distinguished as critical (i.e. Category 1–2 roosts) due to their use as maternity or permanent/ regular diurnal roosts, the relative 'importance' of others (i.e. Category 3–4 roosts) to the species at a broader scale is less known (i.e. potential for higher categories to facilitate important regional dispersal). It is these situations where the Supersensory Technologies (2025) significance classifications would be of particular importance when considering significance at a broader area contextually.

Table 1. Ghost bat roost categories and significance classification

Category	Roost Usage	Habitat significance		
		(Bat Call 2021)	DCCEEW (2023)	(Supersensory Technologies 2025)
Category 1	Permanent diurnal roost	Critical	Critical	Critical
Category 2	Regular occupancy diurnal roost	Critical	Critical	Important habitat
Category 3	Occasional occupancy diurnal roost	Critical when occurring within 'apartment block' Non-critical when occurring in isolation	Critical when occurring within 'apartment block' Key when occurring in isolation	Low-priority habitat
Category 4	Nocturnal refuge	Non-critical	Key	Marginal significance

Pilbara Leaf-nosed Bat

Roost classifications for Pilbara leaf-nosed bat follow TSSC (2016) and Bat Call WA (2021a). Based on the information presented by GHD (2025) and Supersensory Technologies (2025), the classifications align with appropriate categories for the species and do not require further consideration. Of the 26 caves, 25 align with the classification of a Category 4 roost (nocturnal roost with opportunistic usage/ nocturnal refuge), and one cave (Python Cave) meets the criteria for classification as a Category 3 roost (diurnal roost with occasional occupancy) (Table 8 of GHD (2025)). All caves recorded It is however noted that the classification scheme for Pilbara leaf-nosed bat roosts would likely benefit from a similar revised approach to that proposed by Supersensory Technologies (2025) for ghost bat, to provide a more robust assignment of category and significance.

Additional considerations

Field assessment methodology

In section 2.4.1 *Habitat assessment*, GHD (2025) that 'assessments were conducted from the front (outside) or just inside the cave entrance', though refer to data for internal characteristics being collected also. This includes 'internal characteristics and dimensions of passages and chambers', 'notes on internal cave microclimate, including airflow, internal temperature and humidity (compared to outside ambient conditions)' and 'presence/ absence of bats (seen and/or heard), guano, middens or other evidence'. It is assumed that cave entry was undertaken to some extent to accurately determine these attributes; however it is not clear if cave entry was actually undertaken. It would be beneficial for this to be clarified to provide greater confidence in the results, which are subsequently used to ascertain the roosts classification and significance to species. This is of particular importance given the proposed use of an alternative classification scheme and variation of some classifications (i.e. Python Cave) compared to the currently more broadly accepted Bat Call (2021b) classification scheme.

Thank you for the opportunity to complete this review. Should you have any queries or wish to discuss any aspect of the review further, please don't hesitate to get in touch.

Yours sincerely,

RYAN ELLIS

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References

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About the Author

Ryan Ellis is a zoologist with over 14 years of experience in environmental consulting, specializing in impact assessment surveys and monitoring for environmental approvals and compliance. He has worked extensively with threatened bat species in the Pilbara (Pilbara leaf-nosed bat (*Rhinonicteris aurantia* [Pilbara form]) and Ghost bat (*Macroderma gigas*)), conducting targeted surveys, monitoring programs, and ecological studies.

Ryan is a member of the National Ghost Bat Recovery Team and provides specialist advice and review services for various projects. Recently, he joined the Pilbara Working Group Expert Panel, offering technical advice for the Department of Climate Change, Energy, the Environment and Water on matters concerning Pilbara species under the *Environment Protection and Biodiversity Conservation Act 1999*.