

## Memorandum

**Date** 14 November 2024  
**To** Superintendent Environmental Approvals  
**From** Principal Biodiversity  
**CC**  
**Subject** Orebody 29/30/35 Significant Amendment: troglofauna supplementary information

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### Purpose

The purpose of this technical memorandum is to provide a summary of troglofauna sampling and the known troglofaunal values of the Orebody 29 (OB29) and Orebody 30 (OB30) area to support the Orebody 29/30/35 Significant Amendment (the Proposal). Orebody 35 (OB35) is not included in this memorandum as no changes are proposed to the OB35 mine pit for the Proposal.

### Background

BHP's mining operations at Orebody 29/30/35 are located between approximately 3 km and 7 km west-south-west of the town of Newman in the Pilbara region of Western Australia (Figure 1). Mining above the water table at OB29 and OB30 commenced 50 years ago in 1974 and was approved under the Newman State Agreement (*Iron Ore (Mount Newman) Agreement Act 1964* (WA)). Mining below water table at Orebody 29/30/35 was approved under Ministerial Statement 963 (MS963) on 18 March 2014. Pre-mining depth to groundwater in the regional aquifers ranged from a minimum of about 30 meters below ground level (mbgl) around OB29 to greater than 50 mbgl at the western edge of OB35. As a result of dewatering for below water table mining, the depth to groundwater has been increased, with current depths to groundwater in the regional aquifer ranging from greater than 90 mbgl west of OB35 and approximately 20 mbgl to 24 mbgl northeast of OB29 across the leaky flow barrier.

Loss of troglofauna habitat from excavation of mine pits above the water table has the potential to directly impact troglofauna species present. Subterranean fauna were first recognized by the Western Australian Environmental Protection Authority (EPA) as an environmental factor to be considered during environmental impact assessment (EIA) in the mid-1990s. Due to the historical nature of the OB29 and OB30 above water table pits pre-dating this, potential impacts to troglofauna were not considered prior to the commencement of mining of the pits.

The Proposal includes the following key activities and elements:

- increase the rate of groundwater abstraction for mine dewatering at Orebody 29/30/35 from the authorised extent of 8 GL/a under MS963 to 24.5 GL/a
- increase the discharge of surplus water to Ophthalmia Dam from 8 GL/a authorised under MS963 to 20.8 GL/a
- construction and operation of a new surplus water pipeline to discharge additional surplus water to Ophthalmia Dam

- clearing of up to 116 hectares (ha) within the Development Envelope for the expansion of OB29 and OB30 mine pits (there is no proposed expansion of OB35 mine pit), additional Overburden Storage Areas (OSAs), construction of pipeline, associated laydown areas, and a ramp.

In consideration of potential impacts from the Proposal relevant to troglofauna, and the previously disturbed nature of the site (presence of mine pits, OSAs and other mining infrastructure and depth to groundwater), this memorandum focuses on the expansion of the OB29 and OB30 mine pits (Figure 1).

## Troglofauna Values

### *Troglofauna habitat*

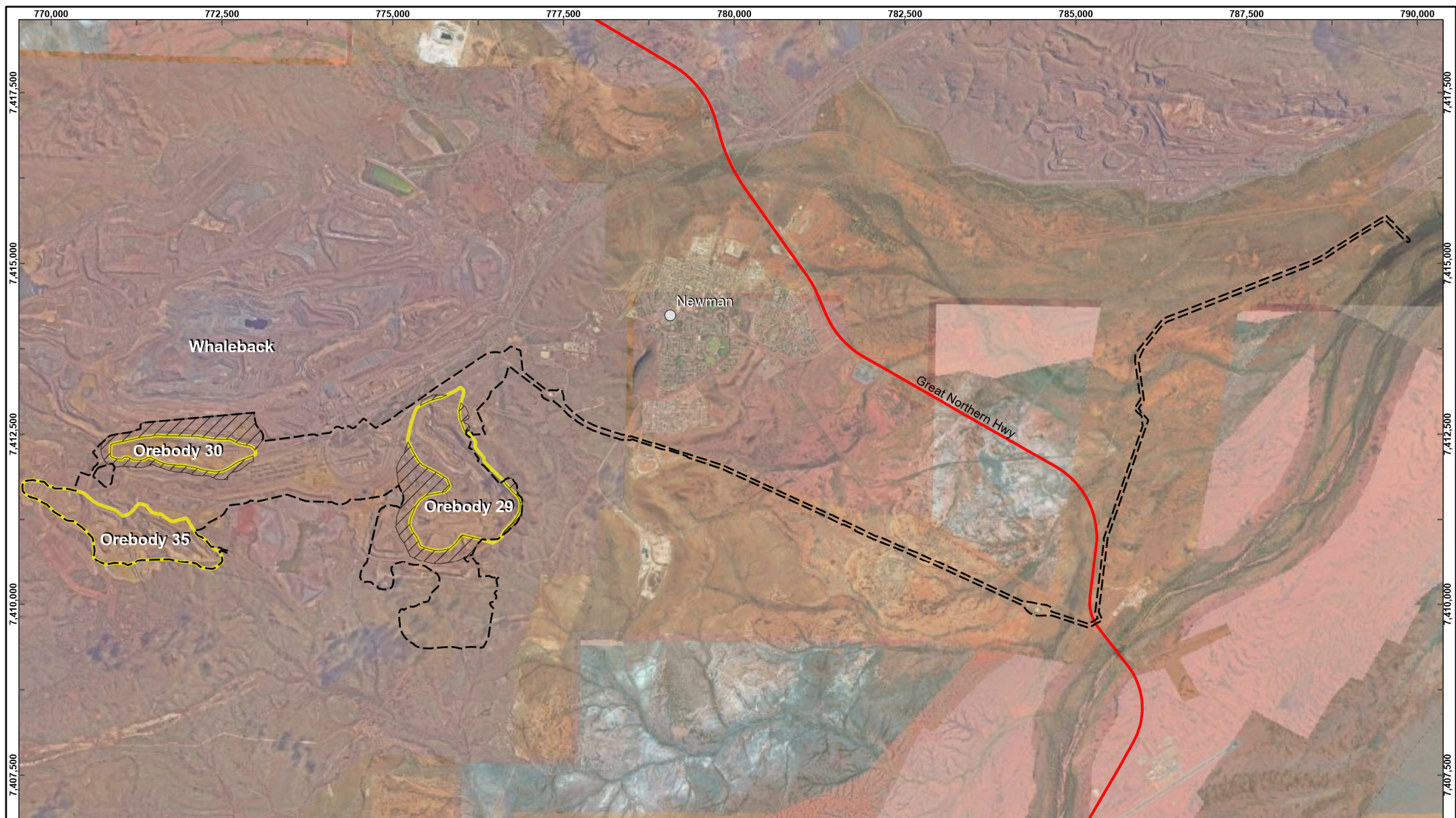
Troglofauna occur within the mineralised Brockman Iron Formation and Marra Mamba Formation within the Ophthalmia area in which OB29 and OB30 are located. The Orebody 29/30/35 area generally consists of the sequence of Tertiary Detritals (mostly alluvium) that occur in association with creek lines and valleys, and the underlying Hamersley Group bedrock that consists of the Brockman Iron Formation, Mount McRae Shale, Mount Sylvia Formation, Wittenoom Formation and Marra Mamba Iron Formation. This is underlain by Jeerinah Formation of the Fortescue Group (Bennelongia 2013).

Orebody 29/30/35 mine is mostly hosted by the upper members of the Marra Mamba Iron Formation (MacLeod and Mount Newman) although mineralisation extends to the lower Nammuldi Member and into the overlying West Angela Member of the Wittenoom Formation (Bennelongia 2013). Potentially suitable habitat for troglofauna within the Orebody 29/30/35 area aligns to areas of Tertiary Detritals and bedrock geologies (Bennelongia 2021). There are areas of folding, faulting and weathering throughout the Orebody 29/30/35 area resulting in heterogeneity of the habitat throughout the area (Bennelongia 2013).

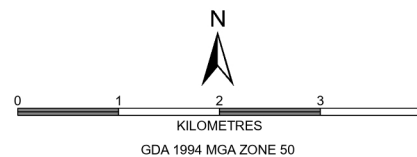
OB30 is part of a lower syncline and OB29 lies within a large-scale north-west plunging open syncline. The geology to the east and southeast of OB29 is similar to that around OB30 (as well as OB35). The Tertiary Detrital sequence of the orebodies extends to the south with a similar geology characterised throughout the Western Ridge (Bennelongia 2013). More specifically, the geology of OB29 is a Marra Mamba type consisting of a conformable sequence of Jeerinah, Marra Mamba Iron and Wittenoom Formations. The structural geology of OB29 is relatively simple, with no major modelled faults and good continuity, with the geology extended beyond the proposed pit to the north-east and west through to OB30 (BHP Billiton 2016). The main stratigraphic units encountered in OB30 are the Jeerinah Formation overlain by the younger Hamersley Group sequence of the Marra Mamba Iron and Wittenoom Formations. There is a southeast-northwest trending fold which is part of the syncline running through OB30, which is also a continuation of the Whaleback and OB29 structure (BHP Billiton 2013).

A slice through the geological model at 530 mRL, which equates to between 40 and 45 m below current ground level, shows the West Angelas (WA1 and WA2), Mount Newman (N1, N2 and N3) and MacLeod (MM) and Nammuldi Members (MU) extending out of the OB30 pit to the east (Figure 2). These Members also extend out of the OB29 pit to the west and up to the north-east (Figure 2).





- Townsite
- Highways
- Development Envelope
- Approved Pits
- Proposed Pit Expansion Area



**BHP**

**PUBLIC**

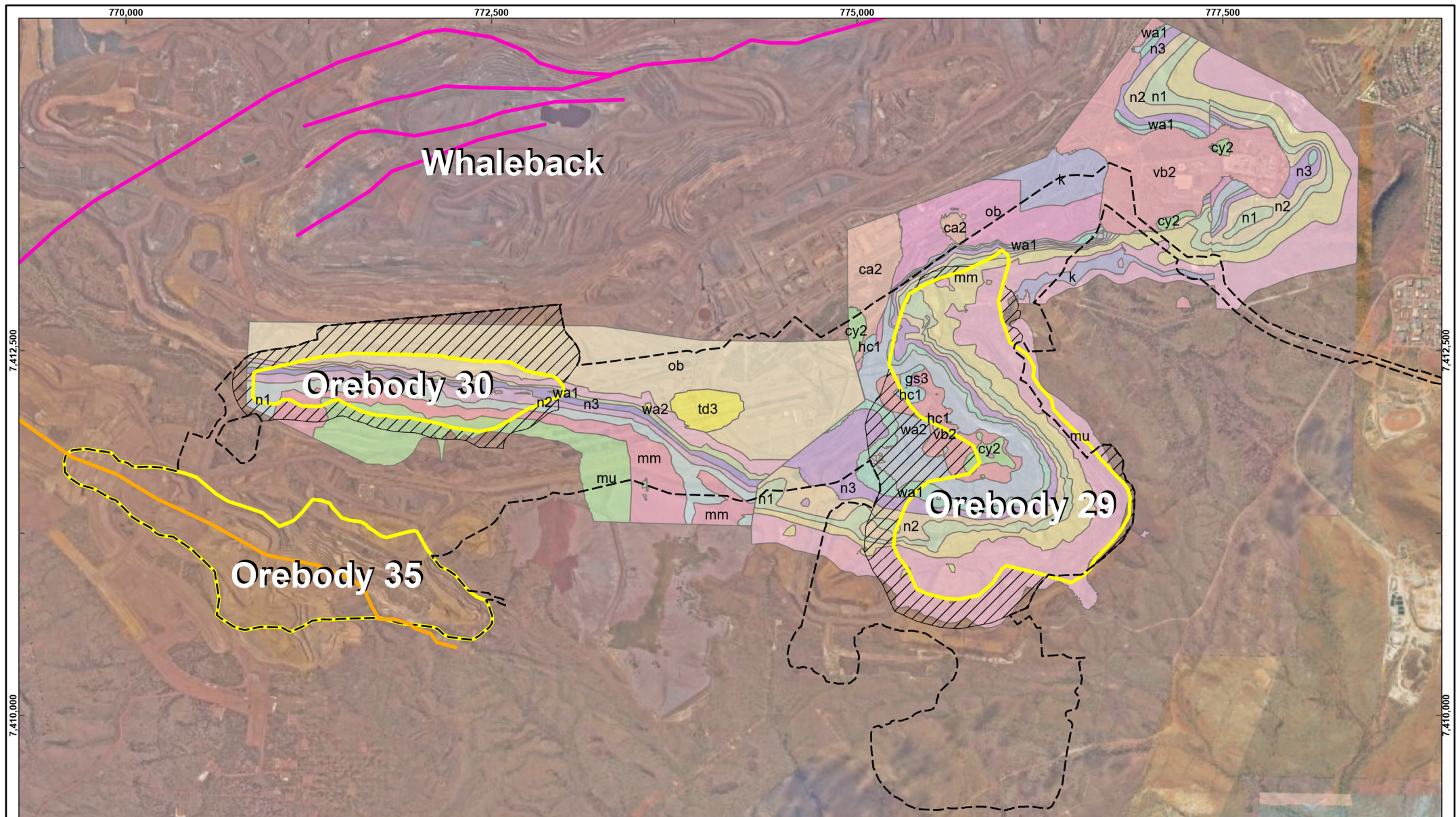
**OREBODY 29/30/35**  
**LOCATION OF OB29/30/35 AND PROPOSED**  
**PIT EXPANSION OF OB29 AND OB30**

**RESOURCE ENGINEERING**

SCALE @ A4:	1:75,000	PREPARED:	GEOMATICS	FIGURE:	1
DATE:	15/10/2024	REQUESTOR:	ENV. APPROVALS		

NO: **A929\_099\_RevB**





Development Envelope

Approved Pits

Proposed Pit Expansion Area

**Regional Faults**

thrust

normal

**Stratigraphy**

Tertiary Detritals (TD3)

Gravelly Siltstone in Tertiary Detritals 3 (GS3)

Calcrete in Tertiary Detritals 2 (CA2)

Clay in Tertiary Detritals 2 (CY2)

Vuggy Breccia (VB2)

Hematite Conglomerate in Tertiary Detritals 1 (HC1)

Doleritic Dykes (K)

Paraburdoo Member (OB)

West Angela Member (WA2)

West Angela Member (WA1)

Mount Newman Member (N3)

Mount Newman Member (N2)

Mount Newman Member (N1)

Macleod Member (MM)

Nammuldi Member (MU)

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**OREBODY 29/30/35**

GEOLOGY OF THE OB29 AND OB30  
AREAS AT 530 mRL

**RESOURCE ENGINEERING**

SCALE @ A4: 1:35,000

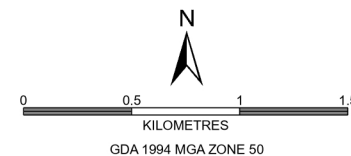
PREPARED: GEOMATICS

FIGURE: 2

DATE: 29/10/2024

REQUESTOR: ENV. APPROVALS

NO: A929\_100\_RevD





### ***Troglofauna sample effort***

Bennelongia (2011a) conducted a comprehensive two-phase survey at OB29 and OB35 during 2009 and 2010. Additional troglofaunal sampling was undertaken in July and August of 2011 at OB35 only (no further sampling was carried out at OB29) to support the proposal to mine above water table at OB35 (Bennelongia 2011b). Figure 3 shows locations of troglofauna sampling at Orebody 29/30/35 and the surrounding area.

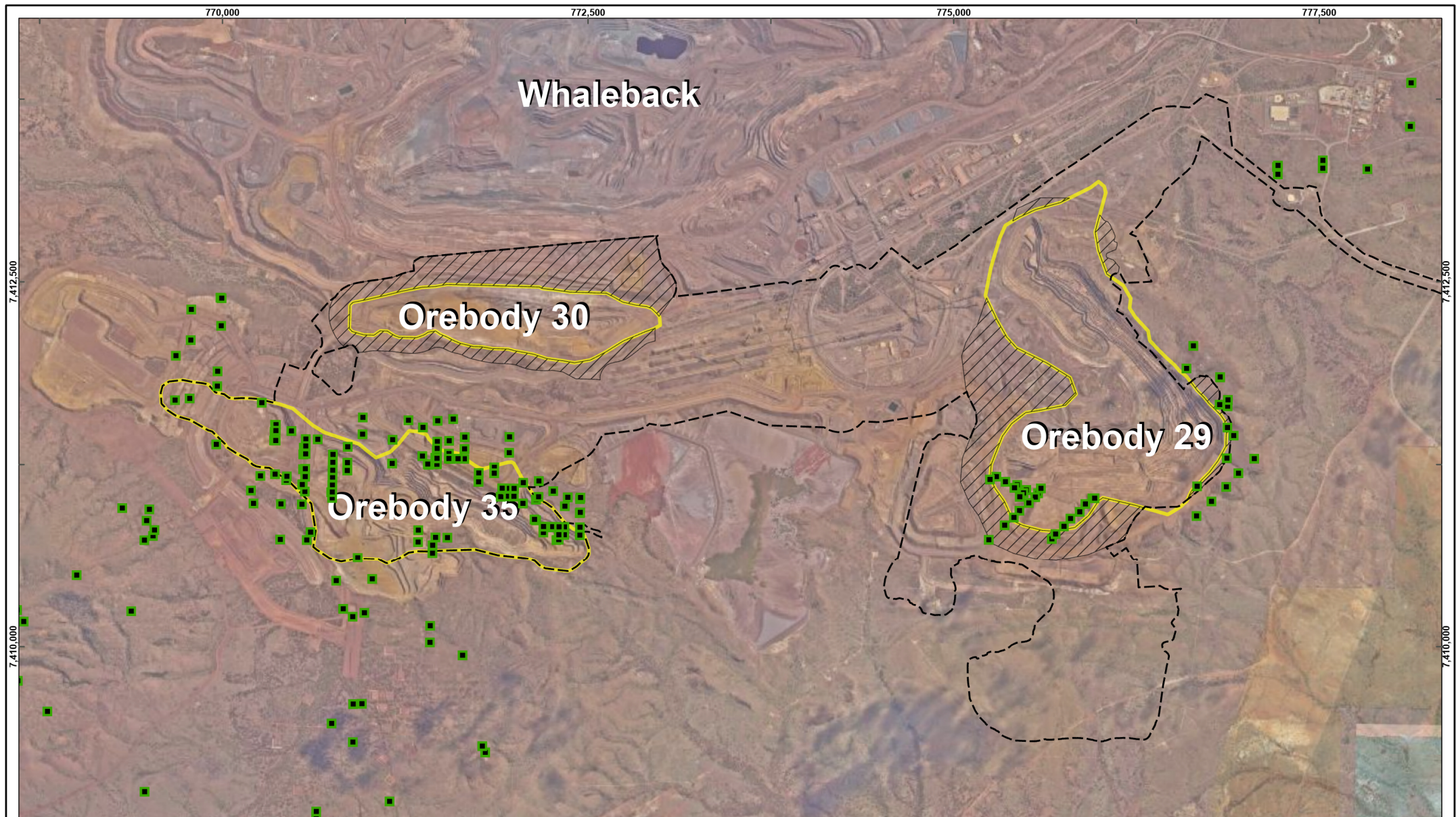
As reported in Bennelongia (2011a), ninety-four (94) holes were sampled for troglofauna within the OB29 and OB35 area in 2009 and 2010 (Figure 3). A total of 44 holes were sampled in the broader OB29 area, including 18 within the approved OB29 pit, eight within the proposed OB29 pit expansion area and a further 18 outside of both the approved pit and proposed pit expansion area (Table 1 and Figure 3). The remaining 50 holes sampled during the Bennelongia (2011a) survey were at OB35 (Figure 3).

Of the 44 holes sampled in the broader OB29 area, seven (18%) yielded troglofaunal species (Table 1 and Figure 4).

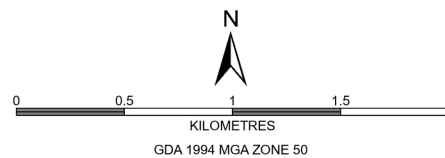
No holes have been sampled in the approved OB30 mine pit area or within the proposed OB30 pit expansion area due to above water table mining being approved and implemented prior to subterranean fauna becoming a factor for EIA and given the proximity of the OB30 pit to Mt Whaleback pit and other mining activities, meaning the proposed expansion area is highly disturbed.

*Table 1: Number of holes sampled in the broader OB29 area and the number of those that yielded troglofauna (Bennelongia 2011a).*

	# Holes sampled	# Holes yielded troglofauna
<b>Within approved OB29 pit</b>	18	1
<b>Within proposed OB29 pit expansion</b>	8	1
<b>Outside approved OB29 pit + proposed pit expansion</b>	18	5
<b>Total</b>	<b>44</b>	<b>7</b>



- Troglifauna Sample Site
- Development Envelope
- Approved Pits
- Proposed Pit Expansion Area



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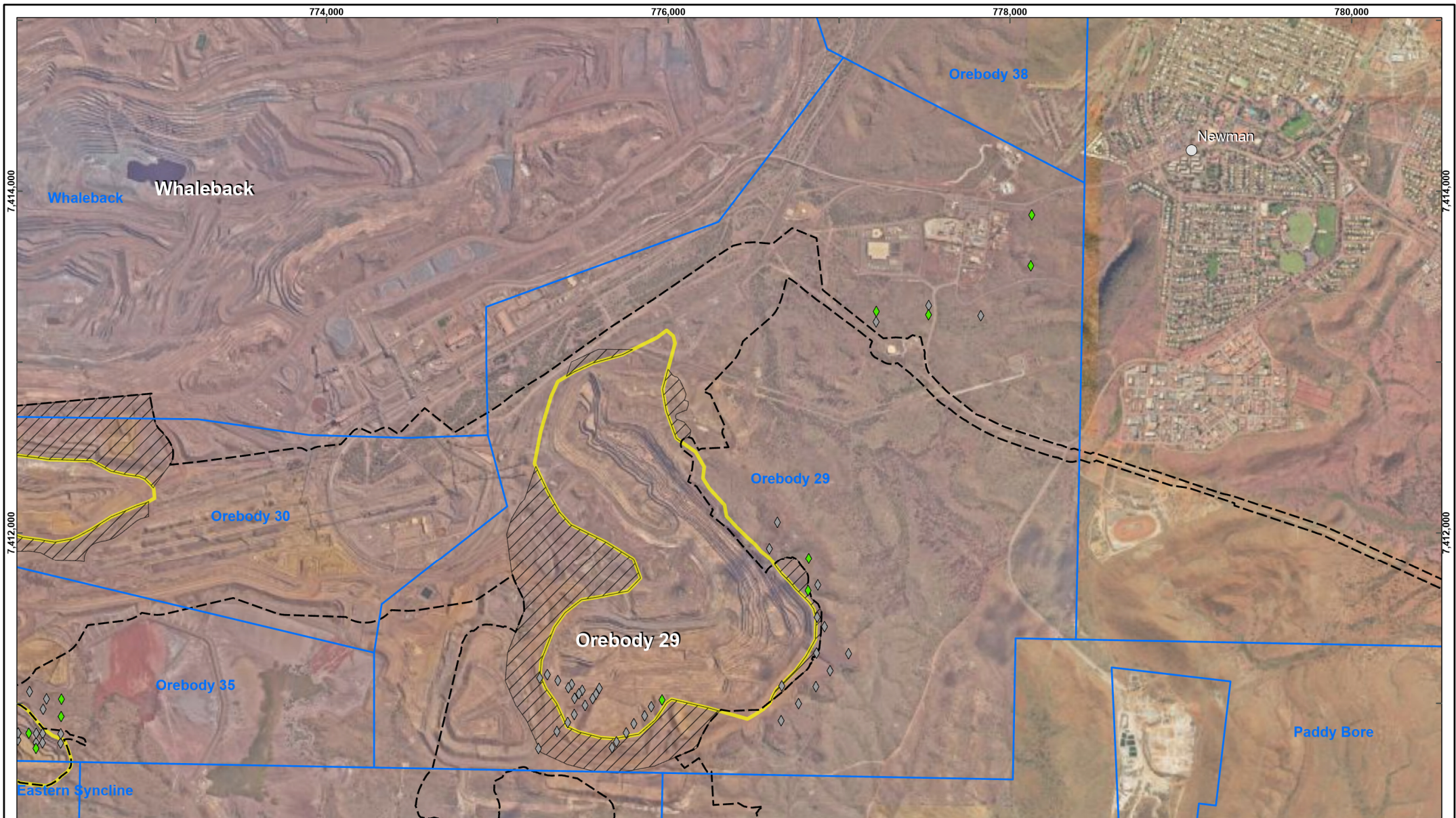
**OREBODY 29/30/35**  
TROGLOFAUNA SAMPLE SITES IN THE  
OB29/30/35 AREA

**RESOURCE ENGINEERING**

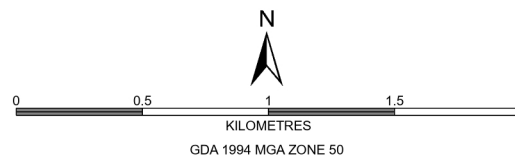
SCALE @ A4:	1:35,000	PREPARED: GEOMATICS	FIGURE: 3
DATE:	18/10/2024	REQUESTOR: ENV. APPROVALS	

NO: A929\_101\_RevB





- Townsite
- Highways
- Development Envelope
- Approved Pits
- Proposed Pit Expansion Area
- Deposits
- Troglofauna Sample Sites**
- Sample Site - Troglofauna Observed
- Sample Site - Troglofauna Not Observed



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**OREBODY 29/30/35**

**TROGLOFAUNA SAMPLE SITES IN THE  
BROADER OB29 AREA INDICATING WHICH  
SITES YIELDED TROGLOFAUNAL SPECIES**

RESOURCE ENGINEERING

SCALE @ A4:	1:30,000	PREPARED: GEOMATICS	FIGURE: 4
DATE:	18/10/2024	REQUESTOR: ENV. APPROVALS	

NO: **A929\_102\_RevB**

### **Troglofauna species**

Fourteen (14) troglofaunal species were recorded from the OB29 and OB35 area during the Bennelongia (2011a) survey. Of those, four species are known from the broader OB29 area (includes the sampling between 1.5 km and 2.6 km north-east of the OB29 pit) (Figure 5), and the remaining ten were from OB35. These are Atelurinae sp. B09, *Lophoturus madecassus*, Pauropodidae sp. B09 and *Phaeconeura* sp. indet. Only one species, Atelurinae sp. B09, is known from within the approved OB29 pit area and two species, Atelurinae sp. B09 and Pauropodidae sp. B09, are known from the proposed OB29 pit expansion (Figure 5). Both species are also known from outside the approved OB29 pit and the proposed OB29 pit expansion (Table 2). Further information about each of these four species is summarised in Table 2.

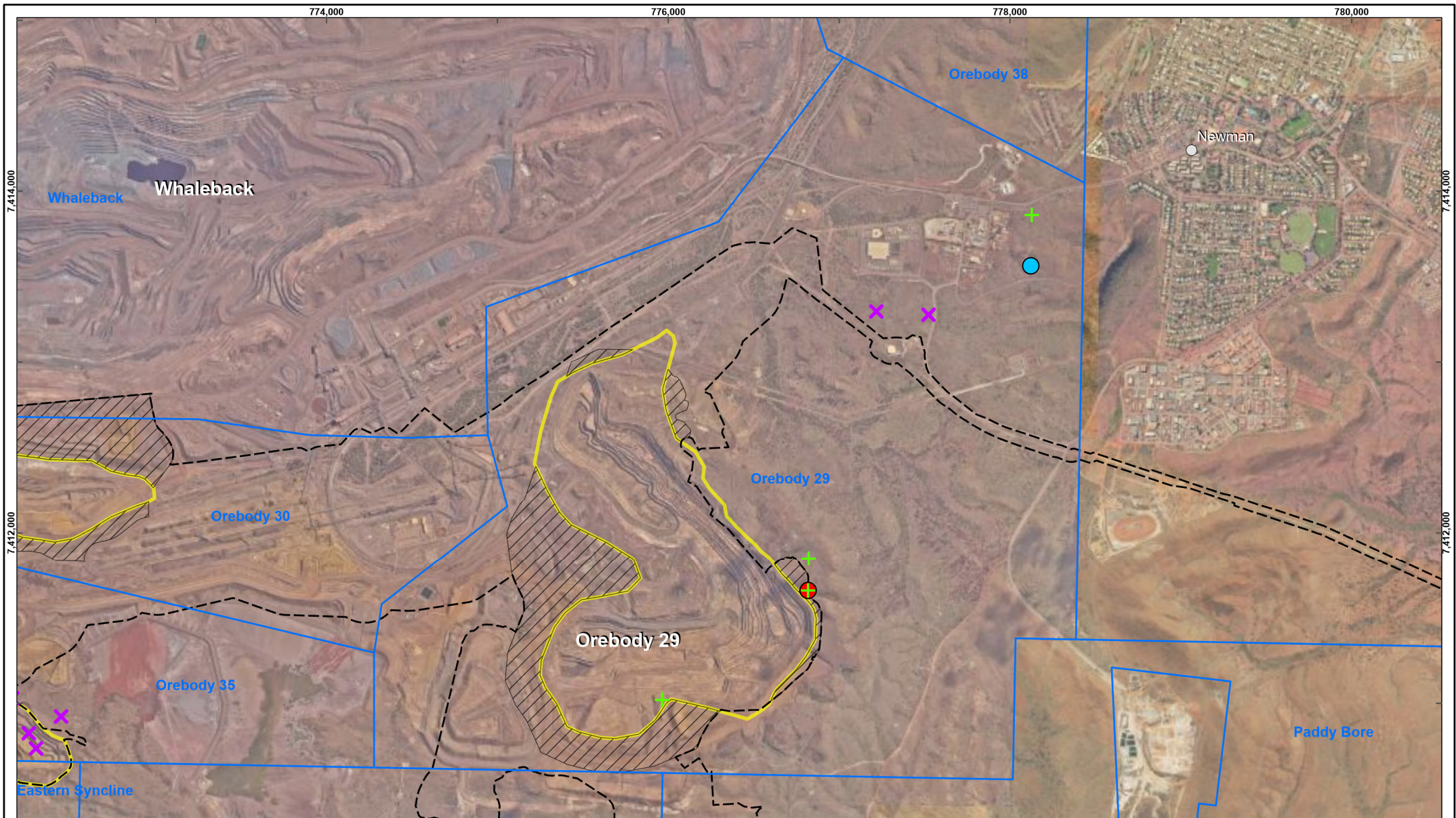
Bennelongia (2011a) noted that the troglofauna community at OB29 was relatively depauperate. This was thought to be due to the proximity of sampling to the existing mining operations and disturbed nature of the area.

Table 2: Troglofauna species from the wider OB29 area and their known distributions.

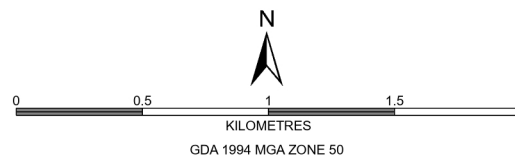
Species	Within approved OB29 pit	Within proposed OB29 pit expansion	Outside approved + proposed OB29 pit	Comments
<b>Atelurinae sp. B09</b>	Yes	Yes	Yes	Known from 2.3 km north-east of the OB29 proposed pit expansion.
<b><i>Lophoturus madecassus</i><sup>1</sup></b>	No	No	Yes	Widespread species throughout the Pilbara.  Reported as <i>Polyxenida</i> sp. B1 in Bennelongia (2011a).
<b>Pauropodidae sp. B09</b>	No	Yes	Yes	Also known from Western Ridge at a location approximately 11 km to the southwest of OB29.  Reported as <i>Pauropodina</i> sp. B9 in Bennelongia (2011a).
<b><i>Phaeconeura</i> sp. indet.</b>	No	No	Yes	Higher order identification but two regionally widespread species from this group are known from the Eastern Pilbara region.  Reported as Meenoplidae sp. in Bennelongia (2011a).

<sup>1</sup> Please note that species names used within this memo represent updated nomenclature and may differ to species names reported within Bennelongia (2011a).





- Townsite
  - Highways
  - Development Envelope
  - Approved Pits
  - Proposed Pit Expansion Area
  - Deposits
- Troglofauna Species**
- + Atelurinae sp. B09
  - Lophoturus madecassus
  - ⊕ Pauropodidae sp. B09
  - × Phaconeura sp. indet



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**OREBODY 29/30/35**  
**TROGLOFAUNA SPECIES WITHIN THE**  
**BROADER OB29 AREA**

**RESOURCE ENGINEERING**

SCALE @ A4: 1:30,000 PREPARED: GEOMATICS FIGURE: 5  
 DATE: 18/10/2024 REQUESTOR: ENV. APPROVALS

NO: A929\_103\_RevB

## Conclusion

The Proposal is seeking to expand the approved OB29 and OB30 mine pits.

Suitable habitat within the OB29 and OB30 areas potentially occurs within the Tertiary Detrital sequence and the underlying members of the Marra Mamba Iron Formation. A slice through the geological model at 530 mRL, which equates to between 40 and 45 m below ground level, shows the West Angelas, Mount Newman and MacLeod and Nammuldi Members of the Marra Mamba Iron Formation extending out of the OB30 pit to the east. These Members also extend out of the OB29 pit to the west and to the north-east.

Due to the historical activities of above water table mining at OB29 and OB30 limited troglofaunal sampling has been undertaken at OB29 and no sampling has been undertaken at OB30. Bennelongia (2011a) conducted a two-phase subterranean fauna survey in 2009 and 2010 at OB29 and OB35 to support the proposal to mine above water table at OB35. This program yielded low numbers of troglofaunal animals at OB29, with troglofauna recorded from only 18% of holes sampled in the broader OB29 area.

Only four troglofauna species are known from the broader OB29 area. This low diversity of troglofauna recorded was considered by Bennelongia (2011a) to be due to the proximity of sampling to the existing mining operations and the disturbed nature of the area. All four of these species are known from outside the approved OB29 pit and proposed OB29 pit expansion. Therefore, the proposed expansion of OB29 and OB30 is not predicted to result in significant impacts to the four troglofaunal species and these species are expected to remain outside of the Development Envelope of the Proposal.



## References

- Bennelongia Environmental Consultants (Bennelongia) (2011a) *Troglofauna Survey at OB29/ OB35, Mount Whaleback*. Report prepared for BHPBIO, April 2011, Western Australia.
- Bennelongia Environmental Consultants (Bennelongia) (2011b) *Troglofauna Assessment at OB35, Mount Whaleback*. Report prepared for BHPBIO, October 2011, Western Australia.
- Bennelongia Environmental Consultants (Bennelongia) (2013) *Stygofauna Assessment at OB29/30/35, Mount Whaleback*. Report prepared for BHP Billiton Iron Ore, April 2013, Western Australia.
- BHP Billiton (2013) *Report OB30 MIJ 156 Resource Geology*. Internal report, March 2013.
- BHP Billiton (2016) *Resource Report RGR EPH 2016 OB29 V3 Resource Estimate Report*. Internal report, October 2016.
- Environmental Protection Authority (EPA) (2016) *Environmental Factor Guideline – Subterranean Fauna*, EPA, Western Australia.