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**Ref:** APP-0012904

29 August 2025

Mr. Darren Walsh
Chair
Environmental Protection Authority Western Australia
Prime House, 8 Davidson Terrace, Joondalup, Western Australia

Dear Mr Walsh

**Mulga Downs Iron Ore Mine – Assessment No. 2326 – Environmental Review Document – Response to Submissions**

On 2 July 2025, HanRoy (on behalf of Hancock Prospecting Pty Ltd) took receipt of the Summary of Submissions which detailed matters raised by Environmental Protection Authority Services (EPAS), Government agencies and the public with respect to the Mulga Downs Iron Ore Mine Environmental Review Document (ERD) and supporting documentation.

Since receipt of the Summary of Submissions, HanRoy, working with specialist environmental professionals, has developed the Response to Submissions (RtS, this document). Focus was placed on addressing what the EPAS considered key issues:

- Residual impacts to *Hibiscus* sp. Mulga Downs (S. Hitchcock SH 638) and the Pilbara leaf-nosed bat.
- Environmental management measures put forward through the ERD and supporting management plans.
- Monitoring of sheet flow dependent vegetation, riparian vegetation, northern quoll, and the Pilbara leaf-nosed bat.

Detailed responses to the 36 comments raised by the EPAS, Government agencies and the 42 public submissions are provided below. The development of the RtS has resulted in the revision of the ERD, Water Management Plan (WMP) and Conservation Significant Fauna Management Plan (CSFMP). The ERD is now supported by three additional studies, which have been recently completed to inform the RtS. The revised ERD, WMP, CSFMP and additional studies accompany this letter.

Due to the sensitive nature of the topic, HanRoy requests that the response to public submission 41 be redacted prior to publication of these documents.

Should any queries be raised from this RtS, please don't hesitate to contact the undersigned. HanRoy welcomes the chance to workshop any outstanding queries with members of the EPA Board and Assessing Officers.

Kind regards

B McGuire

Brett McGuire

Environment and Approvals Manager

**Encs:**

Environmental Review Document (Rev 5) with additional appendices (10e [Spectrum 2025], 31 [Biologic 2025a], 32 [Biologic 2025b]) and 35 [HanRoy 2025]).

Water Management Plan (Rev 7)

Conservation Significant Fauna Management Plan (Rev 5).

# The Proposal – Comments from EPA Services

**Table 1 Comments From EPA Services**

| Item | EPA Services and Agency Comments | Proponent Response |
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| **Flora and Vegetation** | | |
| **1.** | Impacts to the Priority flora species have not been adequately considered.<br><br>Table 17-6 of the ERD states that records of Dolichocarpa sp. Hamersley Station (A.A. Mitchell PRP 1479) (P3) were not publicly available. However, this species was previously known as Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479), and publicly available information is available for the Eliwana Railway Project (Biota18). The Dolichocarpa sp. Hamersley Station (A.A. Mitchell PRP 1479) is also referenced in the referral document for the East Hamersley Railway Project (FMG 2023). | As an outcome of the response to submissions, HPPL have undertaken a review of the impact assessment for Priority flora for the Project.<br><br>Table 17-6 has been reviewed and updated. Records from Eliwana Rail Project (3 records) have been included. Whilst *Dolichocarpa* sp. Hamersley Station (A.A. Mitchell PRP 1479) has been referenced in East Hamersley Railway Project referral document, the number of species identified and impacted by that project is not currently publicly available and therefore cannot be considered in the assessment. |
| **2** | The Environmental Review Document (ERD) and management plans do not include sufficient management actions for flora and vegetation.<br><br>Based on the information provided, the Priority 1 *Hibiscus sp*. Mulga Downs (S. Hitchcock SH 638) has a limited number of known individuals and a highly restricted distribution. The proposal will clear 622 individuals of this species, representing a 35.7% loss of known records. Indirect impacts are likely to further compound this level of impact, such as from fragmentation, weeds, dust deposition, and altered hydrological regimes impacting the species and the habitat which it is found in. For example, 100% of catchment 10 and 93% of catchment 11 will be impacted by altered hydrology (Appendix 3 of the ERD), which could adversely impact suitable habitat. Further mitigation measures should be proposed to reduce, or offset, the proposed level of impact to the Hibiscus sp. Mulga Downs (S. Hitchcock SH 638). This should include targeted management of sheet-flow dependent vegetation and Hibiscus sp. Mulga Downs (S. Hitchcock SH 638), such as for dust suppression activities, surface water management, and managed aquifer recharge. | HPPL have reviewed and updated the Environmental Review Document (ERD), Water Management Plan (WMP) and Conservation Significant Fauna Management Plan (CSFMP) in response to the EPA Services and Public comments. Management actions for flora and vegetation have been revised to include additional survey and assessment outcomes and to target residual risks from the Project.<br><br>A further targeted survey for *Hibiscus* sp. Mulga Downs (S. Hitchcock SH 638) outside of the Development Envelope within potentially suitable habitat, was completed by Spectrum (Scott Hitchcock) in July 2025. The data from this survey is shown in (updated) Figure 9.8. The survey identified a further 2,485 individuals, all of which are located outside of the Development Envelope. This brings the total number of known individuals to 4,226 of which the Proposal directly impacts 14.72% (down from 35.7%). This study is referenced as Spectrum (2025) and appended to the ERD as Appendix 10e.<br><br>A number of the locations of this species occur in areas of the Indicative Footprint associated with supporting infrastructure, such as roads, bore pads etc. As part of the detailed design for the Proposal, supporting infrastructure will be located to further minimise impacts to this species. Table 9-15 has been amended to include a commitment that final location of non-fixed Proposal elements (i.e. linear / supporting infrastructure) will be designed to minimise impacts to Priority flora species. Given this species is associated with sheet flow vegetation, management measures that ensure that sheetflow is maintained will minimise potential impacts on this species. Objective-based provision item 3 of the WMP outlines management actions to mitigate impact on vegetation downstream of mine disturbance areas due to interrupted runoff regime. Section 3.3 of the WMP outlines vegetation health monitoring to be conducted in sheet flow vegetation areas. The final locations of the vegetation monitoring have not yet been determined; however, monitoring sites will be located in vegetation type AWL (1), which is a sheetflow dependent vegetation type known to support the majority of *Hibiscus* sp. Mulga Downs (S. Hitchcock SH 638) individuals recorded within the Development Envelope.<br><br>The WMP also outlines the trigger levels for groundwater associated with MAR. These trigger levels have been determined such that there is no surface expression of groundwater or water logging of vegetation.<br><br>Indirect impacts resulting from changes to hydrology are discussed in Section 9.6.2.4. Other potential indirect impacts, including dust, are also considered in Section 9.6.2 of the ERD.<br><br>Management of dust suppression activities is outlined in Table 9-15 of the ERD and include:<br><br>• Sealing of the Northern Haul Road will avoid dust emissions generated along the approx. 36 km haulage route to the Great Northern Hwy. Subsequently, this minimises the need to use water along this route for dust suppression during operations.<br>• Dust control measures will be implemented throughout the life of the Proposal and will include: |

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| | ○ Saline water (> 5000 mg/L TDS) shall not be used for dust suppression.<br>○ Dust suppression techniques (e.g. water trucks) shall be used on unsealed roads and access tracks, cleared areas and at locations of high dust risk.<br>○ Vehicle speeds on haul roads, work and camp sites shall be reduced where necessary to minimise dust emissions (as detailed in the CSFMP).<br>○ Vegetation clearing and earthworks during high winds (>50 km/hr) shall be avoided.<br>○ Clearing activities will be staged to minimise areas of exposed surfaces.<br><br>The above measures are considered sufficient to ensure potential impacts on conservation significant species are managed. |
| It is noted that section 9 of the ERD states that "ongoing monitoring of vegetation health and condition, including mapped records of this species [Hibiscus sp. Mulga Downs (S. Hitchcock SH 638)], will be undertaken as outlined in the Water Management Plan." However, there is no monitoring of priority flora in the Water Management Plan (WMP). | Wording in section 9.6.1.2 has been updated to reference monitoring that is included in WMP. The WMP has also been reviewed and updated to include consideration of Priority flora as part of the vegetation health monitoring.<br><br>*Hibiscus* sp. Mulga Downs (S. Hitchcock SH 638) (Priority 1) has shown a possible habitat preference to sheetflow dependent vegetation. Site selection for monitoring potential impacts to sheetflow dependent vegetation from changes to surface water flows includes locations in *Hibiscus* sp. Mulga Downs (S. Hitchcock SH 638) habitat and proximal to known populations.<br><br>Management of direct impacts from clearing of vegetation to Priority flora will be through the HPPL Ground Disturbance Permit Procedure (HNR-00000-GD-PRO-0001). |
| Similarly, the ERD (section 9.6.2.3) states that weeds will be managed in accordance with Appendix 12 (the Conservation Significant Fauna Management Plan (CSFMP)). However, the CSFMP refers to the implementation of an annual weed monitoring and management program but does not include any specific detail for managing impacts to flora and vegetation. | Wording in section 9.6.2.3 has been updated to refer to weed control measures specific to flora and vegetation impacts.<br><br>As discussed in section 9.6.2.3. HPPL has a number of established weed and hygiene management measures to reduce the risk of existing weeds being spread or new weeds being introduced into the Development Envelope including:<br><br>• Environmental Compliance Standard (HNR-0000-EN-STD-0001);<br>• Significant Fauna, Flora and Weed Identification Manual (HNR-0000-EN-MAN-0001);<br>• Imported Materials Weed Hygiene Inspection Form (HNR-0000-EN-TEM-0004);<br>• Vehicle & Mobile Equipment Weed Hygiene Inspection Form (HNR-0000-EN-TEM-0014).<br><br>Weed control measures include:<br><br>• Targeted weed control (including in areas around the clearing front and in retained native vegetation adjacent to cleared areas);<br>• Implementation of weed hygiene measures as outlined in documentation listed above; and<br>• Progressive clearing and rehabilitation to minimise the opportunity for weeds to become established. |
| The WMP and the ERD (sections 7 and 9) do not provide sufficient detail on the measures proposed to mitigate and manage impacts associated with changes to sheet flow regimes, such as to sheet flow dependent Mulga. Further detail should be provided on the proposed surface water management measures, such as the location of culverts/floodways. | Preliminary locations selected for the proposed culverts for linear infrastructure have been captured in the 2D flood modelling completed by AQ2 (2025). This report also outlines that the detailed design of culverts will be detailed in future stages of work and this model did not include all proposed culverts. This modelling however, confirmed flows would continue downstream of linear infrastructure based on preliminary locations.<br><br>Section 9.6.2.4 describes the water balance assessment of Fortescue Valley woodland vegetation communities completed by AQ2 (2025) and the associated flood modelling. This section explains the vegetation communities are periodically exposed to drought and waterlogging stress under baseline conditions and have adaptations to cope with this (AQ2 2025). Importantly, the hydrological impact assessment identifies that all baseline hydrological processes will be maintained. |

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| | | The 2D flood modelling predicts the containment of runoff within the mine development areas will cause a reduction in flood levels within the Fortescue Valley to the south of the Development Envelope with approximately 310 ha subject to decreased flood levels of >5 cm following a 63% AEP rainfall event. The magnitude of predicted change was considered modest noting that the dominant species in these vegetation types are well adapted to periodic flooding and drying and are unlikely to be significantly affected by the predicted hydrological change of decreased flood levels.<br><br>As outlined in section 3.3 of the WMP, vegetation heath monitoring will be conducted within sheet flow dependent vegetation to assess any changes in health or condition of vegetation association with changes to hydrological regimes. |
| | To ensure monitoring and management measures are appropriate, sufficient baseline data is required. Regarding the *Hibiscus sp*. Mulga Downs (S. Hitchcock SH 638), this should include baseline data on the surface water environment and health of sheet flow dependent vegetation. | As discussed in Item 2, a targeted survey for *Hibiscus sp*. Mulga Downs (S. Hitchcock SH 638), was completed in July 2025 which provides further baseline information on the extent and locations of *Hibiscus sp*. Mulga Downs (S. Hitchcock SH 638) outside of the Development Envelope (all recorded locations now shown in Figure 9.8) (Spectrum 2025, *in prep.*). Objective-based provision item 3 of the WMP outlines management actions to mitigate impact on vegetation downstream of mine disturbance areas due to interrupted runoff regime. Section 3.3 of the WMP has been updated to outline the vegetation health monitoring to be conducted in sheet flow vegetation areas, including areas where this species has been recorded. The final locations of the vegetation monitoring have not yet been determined; however, transects/monitoring sites will be located in areas that support *Hibiscus sp*. Mulga Downs (S. Hitchcock SH 638).<br><br>Section 3.3 of the WMP describes the vegetation health monitoring program. Further site verification and baseline monitoring, to inform the vegetation health monitoring program, is planned to occur in H1 2026, prior to the construction phase of the Proposal. |
| **3.** | It is not clear what the full extent of impacts to the Mitchell grass plains (*Astrebla* spp.) on the gilgai of the Wona Land System Priority Ecological Community (PEC) will be as indirect impacts (e.g. changes to surface water hydrology) do not appear to have been fully considered.<br><br>Similarly, the potential indirect impacts to the Freshwater claypans of the Fortescue Valley PEC remain uncertain, as potential impacts via groundwater drawdown and mounding are based on conceptual hydrological modelling. In comparison to other claypans in the Fortescue Valley, claypans on the Mulga Downs Station are larger, provide greater variety of habitat, have a diverse floral community, support unique and restricted invertebrate species, and support a high number and diversity of waterbirds (Pinder et al. 2017).<br><br>Further mitigation and management measures should be proposed to ensure the proposal does not adversely affect the Mitchell grass plains (*Astrebla* spp.) on gilgai of the Wona Land System PEC or the Freshwater claypans of the Fortescue Valley PEC. | **Wona Land System PEC**<br><br>Section 7.5 of the Baseline Report (AQ2 2025) provides the following summary of the ecohydrological characteristics for the Wona Land System (refer Attachment 1 of Attachment 3 - Mulga Downs: Responses to EPA Comments (AQ2 2025b)):<br><br>• Level to very gently inclined basaltic plains. Soils mostly comprise self-mulching cracking clays and some deep red-brown non-cracking clay with stony mantles.<br>• Minimal contribution to the catchments of the Fortescue Valley wetlands, mainly local infiltration.<br>• Tussock grassland communities predominantly rain fed.<br><br>The Wona Land System falls within the Basaltic Tablelands ecohydrological unit (EHU) with further details regarding the elements and processes of this EHU provided in Section 8.2 of the Baseline Report (AQ2 2025) (refer Attachment 1).<br><br>The proposed Project haul road crosses the boundaries of the mapped Wona Land System area and environmental culverts will be installed at drainage lines to allow distribution of flow across the road. The flatness of the land system means that transfer of water via runoff processes will be limited and direct rainfall on the land system will be the dominant source of water for vegetation.<br><br>The flood modelling (refer Sections 4.3 of AQ2 2025 & AQ2 2024) has simulated the Wona Land System (Basaltic Tablelands) by applying a high roughness coefficient and rainfall losses to simulate the retention of water within the land system. The flood difference mapping indicates limited changes to flow depths in the drainage lines which cut through the Wona Land System due to construction of the haul road (which has been simulated without any culverts).<br><br>The results of the flood modelling indicate that the impacts to the Mitchell grass plains are likely low/negligible and were therefore not considered further in the impact assessment.<br><br>**Freshwater Claypans of the Fortescue Valley PEC** |

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| | | The Water Management Plan (WMP) has been revised to include provisions that pertain to management of the claypans. These provisions are: (1) to assess the hydroperiod and water recession rates from the claypans following large rainfall events to identify if mining is impacting the retention of water within the claypans from pre-development conditions. (2) to monitor for vegetation health within the claypans which will act as an indicator for both surface water and groundwater impacts.<br><br>Additionally, the WMP includes commitments to continue baseline water quality and water flow monitoring for the claypans to build on the baseline hydrological knowledge-base. |
| **4.** | Riparian vegetation does not seem to have been fully considered.<br><br>Figure 9.7 of the ERD describes only a small section of the development envelope is considered riparian vegetation. However, there is vegetation within drainage lines and sheet flow dependent vegetation that would be considered riparian vegetation. The impact assessment should be revised, as it states that only 4.31 ha of riparian vegetation will be impacted.<br><br>It is noted that the WMP (e.g. Figure 4-3) describes 'riparian' vegetation health sampling locations throughout the development envelope. The WMP should also be revised after the impact assessment is corrected. | Sheet flow dependent vegetation has been considered separately to riparian vegetation within the ERD, on the basis that sheet flow vegetation is typical of surface water flows across land, whilst riparian vegetation is associated with water flowing through streams.<br><br>Maia (2022) surveyed the entire Mulga Downs tenement as well as the Mulga West Borefield area. All identified riparian vegetation, except for AdEvWL occurs outside of the Development envelope. These vegetation types are mapped within the Fortescue River system (AdEvWL, EvWL, BpoFL, EfEbTG, MSL (1), MSL (2), MTG (2) and the mosaic of AdEvWL / BpoFL) and are regarded as significant. These riparian vegetation types are habitat specific, as they are restricted to the Fortescue River and associated habitats.<br><br>The vegetation unit ASL(2) is not considered riparian vegetation by Maia (2022) but rather considered sheet flow dependant as it occurs within creek banks, minor drainage channels and floodplains.<br><br>WMP Figures 4.3 and 4.4 have been updated to clarify the vegetation health sampling locations (i.e. reference to riparian has been removed) and are provided in the updated ERD. |
| **5.** | The management measures for vegetation health should be clarified and improved.<br><br>The trigger/threshold criteria used, such as 'tree condition,' should be clearly defined, and quantitative where possible.<br><br>It is unclear why vegetation monitoring reduces frequency to once per year after the first 3 years of operations. Impacts to vegetation health with surface water diversions, groundwater drawdown, or groundwater mounding may occur throughout the life of the proposal. Monitoring should be performed throughout operations, and into closure, to ensure impacts are not realised over longer timeframes. | HPPL have undertaken a review of the vegetation health monitoring measures within the WMP. The trigger and threshold criteria have been reworded for clarity and to align with updated vegetation health monitoring methodology.<br><br>'Decline' in health and condition variables is defined as a negative change in a quantitative health and condition variable present at a potential impact site and the change is statistically different ($P < 0.05$) from reference sites. The relevant period is from baseline to latest monitoring date.<br><br>Section 3.3 Vegetation Health Monitoring has been updated to include additional detail for the monitoring approach, site locations, method and frequency.<br><br>HPPL have revised the proposed vegetation health monitoring frequency:<br><br>All monitoring will be undertaken annually as a minimum, with the preferred timing of most monitoring being at the end of the dry season around October/November when vegetation is normally subject to the highest degree of drought stress. Specific sites established to monitor groundwater drawdown impacts will be monitored annually at the end of the dry season. The end of dry season timing is also suitable for remote sensing because it coincides with a period when artefacts in vegetation condition variables, due to the occurrence of (seasonal) understorey vegetation, are minimised.<br><br>Additionally, monitoring of vegetation health will continue for two years post-mining to capture effects on vegetation health that may occur as groundwater levels return to the natural state following cessation of dewatering and MAR. |
| **Terrestrial Fauna** | | |
| **6.** | Information gaps continue to exist for the Pilbara leaf-nosed bat (PLNB). | To ensure the information provided in relation to the Pilbara leaf-nosed bat (PLNB) is accurate and complete as possible, HPPL engaged Dr. Kyle Armstrong of SuperSensory Technologies Pty Ltd to aid in the development of the Response to |

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| | | Submissions document in addition to a peer review of the Conservation Significant Fauna Management Plan (CSFMP) as it relates to bat/bat cave management. Dr. Armstrong is a subject matter expert, specialising in bats. He has published a total of 58 published peer-reviewed journal articles, 17 book chapters, 30 species profiles in authoritative field guides, 76 IUCN Red List accounts, written Conservation Advice documents and reviewed and updated the Australian Commonwealth's 'Survey guidelines for Australia's Threatened bats'. Dr. Armstrong has extensive field and research experience on bats in northern Australia (WA, NT, Qld) and is currently overseeing conservation significant bat monitoring systems at three iron ore operations.<br><br>Dr. Armstrong has provided the response to item 6 comments below. |
| | Given the year-round presence of PLNB within the development envelope, and the frequency and timing of calls close to civil twilight, it is likely that a category 1 or 2 roost is present near the development envelope. Irrespective of the category of the cave(s), based on current scientific understanding, the caves in this area are likely to be significant at a local and regional scale regarding PLNB movement through the landscape. | Dr. Armstrong: *"This comment is only partly correct. The available evidence from local surveys certainly supports a scenario that the development envelope is part of the foraging range of an undiscovered colony (or colonies) in a cave outside this area. However, since no diurnal roosts of any kind have been identified, which is based on a suitable level of survey effort, then it follows that the local Priority 4 nocturnal refuges (sensu TSSC 2016 for roost category names) have no direct role in movement of this species across the landscape. Movements and gene flow are based on connections between diurnal roosts only. The extent to which bats actually rely in a significant way on nocturnal roosts when they are out feeding is unknown, but certainly the much greater availability of these in comparison to diurnal roosts is an indication that this resource is probably not limiting."* |
| | Noting that targeted surveys have been conducted within the development envelope, the risk of direct impacts are low. However, without the confirmed location of diurnal roost(s), the risk of indirect impacts (e.g., dust, noise, vibration, light, and groundwater drawdown) remains high. | Dr. Armstrong: *"This comment does not have a strong basis. The extent and magnitude of the quoted indirect impacts is more likely to be limited to the development envelope and areas immediately adjacent—but not extend over a much greater distance to where an undiscovered diurnal roost might be. An exception might be groundwater drawdown, but until the location of the nearest diurnal roost is established, this cannot be tested. While the precautionary principle is usually applied to this species to cover a knowledge gap, in this case the location of undiscovered nearby roosts could be several kilometres, or even beyond 10 km away from the development area, and thus far beyond the influence of drawdown. The listed indirect impacts are also unlikely to have a significant effect on a Priority 4 nocturnal refuge—the effect of dust is relevant to covering of vegetation that supports insect prey; noise and vibration only occur during the daytime blasts, light is present all around the development envelope at night, and groundwater drawdown is only relevant to a diurnal roost."*<br><br>Through the CSFMP and WMP, HPPL have committed to monitoring the impacts of dust through the vegetation health monitoring program and undertaking further study to determine the impact of light on caves/rocky hills habitat. |
| | Management measures should be improved to ensure that the PLNB is not subject to indirect disturbance and the year-round presence of PLNB is not adversely affected by the proposal. | Dr. Armstrong: *"Item 6c is well met by the proposed measures in the CSFMP. For a project that is adjacent to a foraging area of the PLNB, the most important considerations are 1. Reduction in foraging habitat resource from dust; 2. Reduction in habitat quality by the removal of an excessive number of nocturnal refuges; 3. Attraction to lights and subsequent losses from vehicle strikes. These have all been addressed. "* |
| | The proximity of caves within and near the FHEZ to the proposed disturbance footprint is unclear (e.g., Figure 10-8 of the ERD and Figure 1.7 of the CSFMP). Each cave that is proposed to be retained and removed, and any proposed buffer zones, should be clearly identified and presented in a figure with sufficient scale and associated table. | The figures have been revised to address clarity of locations. Additionally, Appendix 2 of the CSFMP provides a tabulated summary of cave locations, retention status and baseline bat presence. |
| **7.** | Clarity should be provided on night parrot survey efforts.<br><br>Section 2.2.3 of Appendix 11e refers to the installation of passive acoustic recorders in likely roosting and nesting sites, however, it is not clear where these sites are located. Map 2.3 of Appendix 11e (and Figure 10.13 | HPPL have undertaken a review of the survey effort undertaken to date for night parrots. The findings of this review, specific to the EPA-S comments is provided here.<br><br>All Acoustic Recording Units (ARUs) were located within areas identified as long unburnt Triodia. The majority of the locations of the identified long unburnt spinifex, and the locations of the acoustic recorders, are outside of the proposed disturbance |

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| | of the ERD) visualises the location of acoustic recorders, but not which recorders were placed in, or near, mature spinifex. Figures should be provided/revised to visualise where mature spinifex was been located.<br><br>It is noted that the density of acoustic recorders appears to be low in comparison to the extent of suitable habitat (as shown in Figure 10.13 of the ERD). As indicated in Appendix 11e, acoustic recorders typically only have an effective range of 200 m, and the night parrot has previously been recorded near the Fortescue Marsh. As such, there remains a risk that night parrots are present within the development envelope. Potential nesting habitat sites should be identified and avoided. | footprint (refer to Figure 10.13 of the ERD). Figure 10.14 of the ERD shows the location of unburnt mature spinifex identified by Spectrum (2024) Pre-clearance surveys for the Night Parrot will be conducted in areas of long unburnt spinifex within Stony Plains and Slopes and Drainage Area/Floodplain habitat.<br><br>*ecologia* (2021) undertook interrogation of aerial imagery and conducted UAV flights to identify areas of long unburnt spinifex. ARUs were deployed in seven locations within the long unburnt spinifex for a minimum of six nights, with three ARUs also deployed within the Chenopod/Cracking Clay Floodplain and Stony Spinifex Plains and Hillslopes habitat types during the initial targeted survey (*ecologia* 2021b).<br><br>Section 2.2.3 of Appendix 11e states:<br><br>Survey techniques for the Night Parrot comprised of habitat assessments, and the installation of passive acoustic recorders (PARs) in likely roosting and nesting sites (i.e. in areas with large, mature clumps of Triodia) in the months following significant rainfall events (DBCA, 2024; DPaW, 2017; S. A. Murphy et al., 2017).<br><br>During the Spectrum (2024) survey, 18 Song Meter Mini passive acoustic recorders (PARs) were deployed for up to eight nights within the habitat types defined in Table 1.1, *especially in areas that contained large, long unburnt Triodia or potential foraging and drinking sites* (DBCA, 2024). Figure 10.14 of the ERD shows the location of unburnt mature spinifex identified by Spectrum (2024) Some areas of the Claypan habitat (outside of the Development Envelope) could not be accessed due to flooding and heritage site access restrictions, and areas previously surveyed were taken into consideration. Of the 18 PARs, 12 were deployed during Phase one (March) and an additional six were deployed during Phase two (May), with a total of 131 recording nights and 1,572 hours of recordings.<br><br>The methods used follow the DBCA Guidelines for determining the likely presence and habitat usage of Night Parrot (*Pezoporus occidentalis*) in Western Australia (2024) and it was confirmed by Nick Leseberg that "*the number of nights of data collected was sufficient to allow robust conclusions around the presence of long-term stable roost sites in the immediate vicinity of each survey point at the time of the survey"* (Appendix B to Appendix 11e).<br><br>Whilst Figure 10.13 of the ERD indicates larger extents of habitat types as outlined in Table 1.1, it has been noted that there are limited areas with large mature clumps of Triodia restricted to the Stony Spinifex Plains and Hillslopes, hence density of the acoustic recorders is not considered low (Figure 10.14 of the ERD shows the location of unburnt mature spinifex identified by Spectrum (2024)) These areas of mature clumps of Triodia were targeted by the acoustic recorders. There are no historical records of the Night Parrot within 40 km of the Development Envelope. Long unburnt spinifex is sparse in the Development Envelope and the few patches were restricted to the Stony Spinifex Plains and Hillslopes in the northeast of the Development Envelope.<br><br>HPPL has committed to pre-clearance survey for the night parrot in areas of mature Triodia, this is discussed below in response to item 8. |
| **8.** | The management measures for conservation significant fauna should be improved.<br><br>It is noted that Table 10-6 and Table 10-12 of the ERD indicate that mature spinifex within the 'stony spinifex plains and hillslopes' habitat type constitutes foraging habitat for the night parrot. However, mature spinifex is potentially suitable roosting/nesting habitat for the night parrot, as outlined in Appendix 11e. The 'stony plains and slopes' and 'drainage area/floodplain' habitat types are also potential nesting sites for the night parrot, and 'mulga woodland' is a potential nesting habitat for the greater bilby. Table 10-6 and 10-12 should be reviewed and revised, as appropriate, as the location of suitable habitat should guide the development of adequate management measures. | As an outcome of the response to EPAS and Public submissions, HPPL have reviewed the ERD and Conservation Significant Fauna Management Plan (CSFMP) management measures to better articulate the outcomes/objective, response actions, reporting and monitoring methodology (indicators, sites, frequencies).<br><br>Table 10-6 and 10-12 of the ERD have been updated to reflect roosting/nesting habitat and foraging habitat for Night Parrot and Greater Bilby as detailed in Appendix 11e.<br><br>As discussed above for comment 7, Spectrum (2025) undertook a review of night parrot habitat at Mulga Downs within the context of updated guidance (DBCA 2024). This work follows on from targeted night parrot survey work, that was completed by Spectrum (2024, Appendix 11e of the ERD). At the time of the Spectrum (2024) survey, DPaW (DPaW 2017) was the relevant guidance. The findings of Spectrum (2025), inform the mitigation measures that will be put in place for night parrot |

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| | | in the CSFMP. Namely, HPPL will undertake pre-clearance surveys for night parrot in areas identified as potential breeding and roosting habitat by Spectrum (2025) within the Development Envelope. |
| | Pre-clearance surveys for the bilby and night parrot should be included in the CSFMP for areas of potentially suitable roosting/nesting habitat. | **Night Parrot**<br><br>As discussed above, HPPL will undertake pre-clearance surveying for night parrot in areas mapped as potential breeding and roosting habitat by Spectrum (2025). This is discussed and managed with the CSFMP.<br><br>**Greater Bilby**<br><br>There has been no evidence of any resident Greater Bilby individuals or populations or use of the area by the Greater Bilby despite extensive surveys of the Development Envelope and regional area, this is discussed in Section 10.3.3.4 of the ERD. Given this, it is considered unlikely that this species is reliant on habitats present within the Development Envelope and there is no significant impact to this species. HPPL considers pre-clearance surveys for the Greater Bilby would not yield any further mitigation of impacts to this species. |
| | The proposed monitoring in the CSFMP (Table 2-3) includes camera trapping for the northern quoll and audio recording for the PLNB, however, there is no specific outcome or objective-based provision to address this monitoring. | The proposed monitoring of Northern Quoll and PLNB presence has been included in the CSFMP as a method by which objective-based provisions may be measured. The use of this data will not be solely relied upon but rather will form part of a larger multivariate dataset, inclusive of dust, light, weed, feral presence, conservation significant species presence etc. This large, multivariate dataset will allow the onsite environment team to review species presence and threatening processes and use this dataset to make adaptive management decisions which will decrease the impact to conservation significant fauna over the life of the Proposal. |
| **9.** | The outcomes-based provisions in Table 2-1 of the CSFMP should be reviewed and improved. It is not clear what the proposed buffer zone of 25 m in threshold criteria 3 is based on, or whether the buffer is likely to adequately protect values associated with the caves. Appropriate buffer zones should be linked to cave stability through geotechnical understanding and may vary between caves. It is also not clear as to whether the proposed buffer zone is in relation to the cave entrance, or the lateral extent of the cave. Further, the use of 'and are viable for significant bat usage' in threshold criteria 3 is vague and should be removed. | Upon review of outcome-based provision item 3, it was deemed superfluous and has since been removed. The limit on clearing of vegetation in proximity to category 4 caves that have been identified for retention is already in place through outcome-based provision 2. All category 4 caves identified to be retained are located within the FHEZ by a minimum of 30 m (majority at least 50 m). Clearing within the FHEZ, which has been excised from the Development Envelope, would be a breach of condition (should the Proposal be approved). |
| | The threshold criteria for outcome-based provision 4 should be revised as exceedance of the current threshold criteria represents irreversible structural damage to the cave and is likely to represent a significant residual impact. | The threshold level action for outcome-based provision 3 (formerly outcome-based provision 4) has been revised to include an action to offset any significant residual impact via the Impact Reconciliation Procedure. |
| | Outcome-based provision 4 appears to only relate to caves 'within the development envelope', which would not include caves within the FHEZ. | Wording for this provision has been revised and subsequently updated to include the FHEZ. |
| | Outcome-based provision 4 should be revised as the trigger and threshold do not match. Where structural damage is chosen as a threshold criteria, it would be more appropriate to include a trigger criteria that also refers to structural damage, albeit at a lesser extent. Further, the triggers for outcome-based criteria 4 (i.e., the PPV limits of 25 mm/s and 75 mm/s) are inappropriate as they exceed the threshold criteria chosen for outcome-based provision 5. | Both outcome-based provisions have been revised to address inconsistencies. Provision 3 (fmr 4) now addresses structural integrity of each cave while provision 4 (fmr 5) addresses peak particle velocity limits (vibration) for the same set of monitored category 4 caves. |
| | It is not clear why there is a 'blast vibration limit' in outcome-based provision 5, as the threshold criteria should represent the upper limit of vibration. | This has been corrected. |

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| Outcome-based provision 5 refers to caves retained 'within the FHEZ', which would not include caves to be retained that are within the development envelope. | This item has been amended to now refer to caves to be retained in the FHEZ and the Development Envelope. However it should be noted that the current impact assessment assumes category 4 caves outside of the FHEZ will not be retained, therefore making monitoring of the susceptibility of these caves redundant. The provision notes *"caves to be retained will be identified as Proposal design progresses. These criteria will be updated accordingly."* To this effect, should caves be chosen for avoidance as a result of future design changes, monitoring locations will be revised as currently all monitoring locations are at category 4 caves within the FHEZ. |
| Table 2-3 of the CSFMP states vibration will be monitored in caves for each blast within 200 m, before, during, and post-blasting. However, Table 2-1 (outcome-based provision 4) states that monitoring will only occur prior to the first blast within 500 m, and for each benchtop blast within 500 m. Each cave that is proposed to be monitored should be included in Table 2-1. It is also not clear if monitoring for structural damage, vibration, and humidity is proposed to occur at all caves that were identified to be retained, or just the one cave that is closest to the blast. Caves that are slightly further away may have a higher susceptibility to impacts from blasting (due to geotechnical reasons, or otherwise), but do not appear to be monitored under this scenario. It is more appropriate to manage each cave that has a potential to be impacted by the blasting. | Through working with Dr. Armstrong on this revision of the CSFMP HPPL have determined a selection of caves (or as close to each cave as acceptable) for installation of equipment that monitors vibration levels continuously. These are provided in the "Locations" section of provisions 3 and 4, while also being detailed in Section 3.2.3 of the CSFMP. |
| The adequacy of using three standard deviations as a threshold criteria for outcome-based provision 6 is unclear, as it has not been justified. It is also not clear which caves would be considered 'viable for significant bat species.' | Following consultation with Dr. Armstrong and his review of the CSFMP, it was suggested that the monitoring of relative humidity was not an appropriate indicator for the value of the category 4 caves. Dr Armstrong provided the following rationale:<br><br>*"Monitoring humidity will be relatively uninformative because these caves are not diurnal roosts, are likely to follow closely the ambient conditions because of their shallow depth, and have little connection to water table levels that could affect their atmospheric condition. It will be difficult to apply meaningful threshold levels to these structures, and they are unlikely to change significantly if there is a change in the structural integrity."*<br><br>HPPL have reviewed this rationale and are in agreeance with Dr Armstrong. Based on this advice, outcome-based provision 6 and monitoring of relative humidity has been removed from the CSFMP. |
| The trigger level and threshold contingency actions proposed across all outcome-based provisions should be developed further, as the majority are not specific activities that will reduce the level of impacts below the trigger and threshold criteria (i.e., many of the actions simply involve reviewing or investigating damage). | The CSFMP has undergone a thorough review and update with additional detail given to trigger level and threshold level actions to ensure the management of these fauna values is aligned to HPPL's adaptive management approach (as discussed in Section 1.5.3 of the CSFMP). |
| As important populations of the northern quoll and PLNB have been observed near the development envelope, adequate outcome-based provisions should be proposed to ensure the presence and abundance of the local populations of these species is not adversely impacted. This should include a comparison against adequate baseline data, as discussed below. | Following on from extensive baseline survey effort for both the northern quoll and PLNB, HPPL understand the seasonal to multi-yearly variation in the presence of individuals of each species in the Mulga Downs area. As a result of this, HPPL have chosen an approach to management of each species that mitigates impacts from threatening processes such as feral animals and habitat degradation (vegetation, caves, water features, dust etc.) rather than monitoring of individual presence/abundance. Through implementation of the northern quoll and PLNB monitoring programs, abundance of individuals will still be reported on, however in periods of long droughts northern quoll abundance may drop to an undetectable level, as known from survey effort in the Development Envelope from 2020 to 2023. The variation in individual abundance does not provide a robust outcome-based measure.<br><br>Additional baseline data has been provided in Section 3 and Appendix 2 of the CSFMP.<br><br>The use of the terminology "important populations of the PLNB" by the EPA here has been reviewed by Dr. Armstrong, to which he has offered the following context with respect to the Proposal: |

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| | *"For the PLNB, the concept of a 'local population' is misleading and not consistent with how the bats use the development area and FHEZ. The concept of a 'local population' should not be applied. The Pilbara contains a single panmictic population (Umbrello et al. 2022), which comprises inter-connected roosts with colonies that change membership via inter-roost movement of individuals. The occurrence of the PLNB in the FHEZ is of individuals out foraging, and those individuals are part of one or more undiscovered colonies in areas adjacent. It should not be assumed that these colonies are isolated given recent work in various published (e.g., Bullen and Reiffer 2021, 2022) and unpublished studies (e.g. work by Fortescue Ltd presented at two recent conferences; Armstrong 2024, 2025). The monitoring proposed programme includes a component for measuring bat presence from ultrasonic microphones, and a requirement to compare this against baseline data. An appropriate way to refer to PLNB that use the development area and FHEZ would be 'individuals from nearby undiscovered colonies that use the development area and FHEZ'."* |
| **10.** All management targets, actions, and indicators in Table 2-2 of the CSFMP should be reviewed. The current management targets are not appropriate to manage the level of risk to terrestrial fauna.<br><br>As consistent with EPA (2024b), management targets should be clear and quantitative, where possible, to demonstrate that the objective is being met. Majority of the current management targets are written as objectives. For example, management target 10 could be written as 'no adverse impacts to fauna habitat from dust emissions.' Whether or not this target is then achieved is guided by the proposed management actions. | HPPL has undertaken a review of all objective-based provisions in the CSFMP to ensure a robust approach to management of conservation significant fauna.<br><br>All management targets in Table 2-2 of the CSFMP have been revised to ensure consistency with the EPA's guidance. To achieve each target, management actions have been reviewed and additional actions provided where appropriate. |
| Management targets 1 to 8 should be removed as limits on clearing of fauna habitat will be included as standard outcome-based condition(s). Any management actions referring to clearing within the FHEZ should also be removed, as clearing outside of the development envelope (including within the FHEZ) would constitute a non-compliance (typically required by condition A1-1 of the Ministerial Statement). | As suggested, objective-based provisions 1 to 8 have been removed from the CSFMP. Consistent with the reasoning for the removal of provisions 1 to 8, HPPL has also removed provision 9. The management target to "minimise clearing of conservation significant fauna habitat required for the implementation of the proposal" is managed through outcome-based provision 1a, whereby any clearing beyond the approved limit of each habitat type would be a non-compliance. |
| Management target 13 should be revised to be an outcome-based provision. | HPPL has amended this objective-based provision and represented the outcome-based management of feral animals in Table 2-1, Item 5. |
| Management target 14 should be revised to ensure the spread of weeds (not just the introduction of new weeds) is appropriately managed. | Management Target 4 (fmr 14) and the indicator for this management target has been revised to consider the spread of weeds within the Development Envelope and the FHEZ. |
| Management target 15 should be revised to be an outcome-based provision and should remove the 'unless approved by the Environment Manager'. The use of saline water for dust suppression would represent a limit or extent of the proposal, likely to be included in condition A1-1 of the Ministerial Statement. A more appropriate outcome-based provision would be in relation to monitoring vegetation health. | HPPL incorrectly stated in this provision that saline water up to 50,000 mg/L TDS would be used for dust suppression. This was a mistake. HPPL has a commitment to not use water >5,000 mg/L TDS for dust suppression. |
| It is not clear what the purpose of management targets 18 and 19 is. Management targets should be written as a clear goal to be achieved through implementation of the management actions. | Management target 18 and 19 have been reviewed based on this comment. The environmental value being protected for these two targets was individuals of conservation significance. The review deemed that this environmental value was largely managed by management target 5 (fmr 16). As a result, additional actions, indicators, locations and reporting items have been added to management target 5 and targets 18 and 19 have been removed. |
| The monitoring described in Table 2-2 should be revised to monitor the value that is to be protected. For example, monitoring for management target 10 is a broad 'visual assessment' of dust emissions. | Monitoring indicators, methods and locations have been reviewed and revised as an outcome of the broader CSFMP review. Monitoring indicators now reflect the value the management target is protecting. |

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| **11.** | Baseline data should be included in the CSFMP.<br><br>To achieve the outcomes and objectives as included in the CSFMP, sufficient baseline data is required. This includes baseline data on the presence and abundance of feral fauna, conservation significant fauna, and weeds. This baseline data is required to be collected prior to disturbance (i.e., prior to commencement of construction activities).<br><br>As important populations of PLNB and the northern quoll have been recorded near the development envelope, baseline data for the PLNB should include call activity and seasonality data, and for the northern quoll should include population and seasonality data. | Baseline data for northern quoll, PLNB and ghost bat has now been included in the CSFMP, see Section 3.1.1 and Appendix 2. Baseline data for feral fauna and weeds has been collected for the Proposal over the period of 2019 to 2024 as detailed/targeted flora, vegetation and fauna surveys were undertaken. HPPL will incorporate those findings as well as updated data, into the CSFMP in the first year of the Proposal.<br><br>See Dr. Armstrong's comments on item 9 with regard to "PLNB population" within the Development Envelope/FHEZ for context. |
| **12.** | The CSFMP does not provide adequate information on the monitoring design.<br><br>The location of monitoring is unclear for some management targets. For example, the location of 'development envelope/proposed action area' for management target 17 is inappropriate and should include specific monitoring and reference sites.<br><br>The CSFMP should provide a justification for the chosen monitoring and reference sites and include these locations in a figure. | Section 3 of the CSFMP has been revised to include additional detail on monitoring design, method and locations.<br><br>The PLNB and ghost bat monitoring program has been designed in collaboration with Dr. Armstrong of SuperSensory Technologies Pty Ltd to ensure HPPL will capture the appropriate data for the PLNB and ghost bat individuals that use the Development Envelope/FHEZ to forage or use the category 4 caves as a nocturnal refuge. |
| **13.** | The inclusion of infrastructure corridors within the FHEZ corridor results in potential impacts such as wildlife mortality, fragmentation, and edge effects that is likely to limit the viability of the corridor for fauna passage. Further consideration should be given to avoiding disturbance within the FHEZ corridor. | As detailed in Section 2.2.3.10 of the ERD, the FHEZ Corridor will only see the development of an infrastructure corridor should the separate Mulga Downs Hub and Rail Spur Proposal (Assessment No. 2358) be approved. In the instance that the Hub and Rail Spur proposal is considered for approval, HPPL will revise the CSFMP to incorporate robust avoidance/impact minimisation options to maintain the viability of the FHEZ Corridor and the fauna values that are provided within it. Should an agreeable management approach not be approved, HPPL will assess other infrastructure alternatives. |
| **14.** | The extent of PLNB habitat that is proposed to be impacted differs between Table 10-12 (4,248.49 ha) and Table 10-15 (1,406.3 ha) of the ERD. This should be clarified, and Table 10- 12 and 10-15 reviewed across all fauna species for accuracy. | The difference between the two numbers presented for PLNB (and other species) in Table 10-12 and Table 10-15 is a result of how HPPL has determined significant residual impacts for conservation significant fauna. Studies for the Proposal have determined that no habitat type within the Development Envelope is Critical to the survival of the PLNB (as discussed in Table 10-15) and through consideration of the impacts to the habitats present, no significant residual impacts on PLNB will result from the Proposal implementation. HPPL does however recognise the importance of rocky hills, stony spinifex plains and hillslopes and drainage line/floodplain habitat types as of high value to a range of conservation significant fauna. This includes PLNB, ghost bat, northern quoll and Pilbara olive python. Considering this, Table 10-15 has been formatted to show the impacts to conservation significant species as they relate to high value habitat within the Development Envelope.<br><br>The high value habitats shown as impacted in Table 10-15 are carried forward to the Impact Reconciliation Procedure. |
| **Inland waters** | | |
| **15.** | As operational data becomes available, the groundwater model should be validated and recalibrated. The adaptive management measures in the WMP should include consideration for this validation and recalibration, as well as incorporate higher resolution digital elevation data to improve topographic representation. | HPPL will employ adaptive management through the life of the Project to incorporate knowledge from the implementation of mitigation measures, monitoring, and evaluation of data against trigger and threshold criteria to more effectively meet regulatory conditions and objectives outlined in the WMP.<br><br>The adaptive management and review approach has been updated in Section 7 of the WMP, which details incorporation of additional knowledge including higher resolution digital elevation to improve topographic representation as it comes to hand to address assumptions and uncertainties to gain increased understanding of vegetation and aquifer response. |

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| | | All amendments to the WMP will be submitted to and approved by the CEO of DWER and DCCEEW. The Management Plans shall also be reviewed, and amendments submitted as and when directed by the CEO.<br><br>Section 9.6.2.4 of the ERD has been updated to reflect the above. |
| **16.** | Section 7.3.7.2 of the ERD describes four surface water fed pools as local receptors. However, Figure 7-29 identifies 5. Clarity should be provided on the characterisation and ecological values of this additional pool, and any potential direct or indirect impacts. | The ERD notes that "Several small, surface water fed channel pools that hold water for a period of time following runoff events, in the Fortescue Valley, south of the Development Envelope occur." The ERD lists four examples of channel pools with the introductory text "These pools include (but are not limited to):". The four pools which are listed are all located downstream (south) of the mining area consistent with the introductory paragraph. The fifth pool, which is shown in Figure 7-29, is located on the northern side of the Development Envelope.<br><br>The report section and figure referred to above are provided in Attachment 3 - Mulga Downs: Responses to EPA Comments . |
| **17.** | It is unclear whether the bores in white in Figure 1-4 (and Figure A3-1) of the WMP represent pastoral bores only, or whether there are bores with other uses. It is also unclear whether the bores as shown by the 'Community' symbol are the only bores used by communities, or whether any other bores in Figure 1-4 are also utilised. Further, Figure 1-4 should be updated to include Rio Tinto and Fortescue operational bores.<br><br>Clarification should be provided on which bores will be monitored for changes to groundwater chemistry (Table 2-3 of the WMP).<br><br>It is unclear whether pastoral, community, and industry bores located near or within the predicted drawdown and mounding areas will form part of the monitoring network. | The figures and report sections referred to in this response are provided in Attachment 3 of Attachment 3 - Mulga Downs: Responses to EPA Comments .<br><br>**Groundwater Users**<br><br>Figure 1-4 in the WMP presents the locations of the Youngaleena and Wirrilimarra Communities as well as bores and wells from DWER's Water Information Reporting (WIR) database. Predominantly these are pastoralist water supplies, although some (if not all) of the unnamed bores in the vicinity of Wirrilimarra, are associated with Fortescue's White Knight exploration area.<br><br>Figure 3.1 and Table 3.1 (see Attachment 3 - Mulga Downs: Responses to EPA Comments ) present the currently licensed draw points (bores) and groundwater well licence (GWL) details under the *Rights in Water and Irrigation Act 1914*. This includes the licenced water supplies associated with the Fortescue (Solomon) railway and RTIO (Goodiadarrie) railway referenced in the Section 1.9 of the Impact Assessment (AQ2 2025). It should be noted that the status of these licenced bores is uncertain. In particular, there is no evidence of any bore or access track for the Fortescue draw points plotted in the Mungurrdu (valley) area.<br><br>AQ2 / HanRoy were invited to visit the Youngaleena Community in November 2024. The main Youngaleena water supply is managed by the Water Corporation under their Aboriginal Communities Water Services program with the bore located within the community grounds. A nearby bore, located ~75 m to the north (still within the community) is sometimes used for irrigation but had not been used for some time. Another bore, ~2 km north of the community, coinciding with that labelled as "Mrd" in the WIR database (and shown on Figure 1-4 in the WMP) was reported to sometimes be used for other purposes (i.e., ceremonies) but, again, had not been used for some time.<br><br>Details regarding the Wirrilimarra water supply bore(s) are unknown, despite HPPL requesting this information through BNTAC.<br><br>**Groundwater Chemistry Monitoring**<br><br>Those bores shown as Salinity Monitoring Bores (Figure A3-4 of the WMP) will be monitored for changes to groundwater chemistry (as per Table 2-3 of the WMP). Additional bores for water quality monitoring will be identified within the mine site area (i.e., downstream of waste rock dumps etc) prior to operations.<br><br>**Bore Monitoring Network** |

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| | | Where possible (i.e., access approval permitting), it is intended that, prior to operations, a survey of mapped water supply bores near or within the predicted drawdown and mounding areas will be undertaken to assess the bore status and baseline conditions. It is assumed that on-going access to community and industry bores will not be permitted, however, some pastoralist bores are likely to be incorporated into the bore monitoring network.<br><br>It should be noted that the planned monitoring bore network (as depicted in Figures 4-1, A3-2, A3-3 and A3-4 of the WMP) includes bores located between the proposed dewatering / MAR borefields and community and industry water supply bores such that any potential impact to these water supplies can be identified well in advance. Should a trigger level be identified at one of these monitoring bores, as per Table 3.1 of the WMP, HPPL will, in conjunction with the stakeholder develop an agreed threshold value and action plan to ensure continuity of suitable quality water availability. |
| **18.** | The management measures in the WMP should be improved.<br><br>The water quality limit of 5,000 mg/L TDS is suitable for most pastoral uses, however, the Australian Drinking Water Guidelines should be referred to for bores that are used as a water supply by Aboriginal communities, for example.<br><br>The response actions in the WMP should be revised to be clear, specific activities that reduce the level of impacts to below the threshold and the trigger criteria. For example, submitting a report to the CEO on the exceedance of the threshold criteria is not a contingency action.<br><br>It is unclear how a 'significant modification' of hydrological function in management target 2, and 'minimal impact' to vegetation and fauna habitat quality in management target 3 will be measured (Table 3-4 of the WMP). The management targets should be revised to be clear and quantitative, where possible. | As an outcome of the response to EPAS and Public submissions, HPPL have reviewed the Water Management Plan (WMP) management measures to better articulate the outcomes/objective, response actions, reporting and monitoring methodology (indicators, sites, frequencies).<br><br>Outcome based provisions for the protection of regional aquifer for groundwater users (pastoral, communities and stygofauna) have been revised. Provisions 1a and 1b will result in the following environmental outcomes:<br>• No measurable change, attributable to the Proposal, to groundwater level at Youngaleena and Wirrilimarra community bores for the life of the Proposal.<br>• No measurable change, attributable to the Proposal, to groundwater quality at Youngaleena and Wirrilimarra community bores for the life of the Proposal.<br>• No exceedance of the drinking water guidelines for beef cattle tolerance limit of 5,000 mg/L TDS for the life of the Proposal for groundwater sourced from pastoral groundwater bores within the Salinity Impact Area.<br>• Groundwater quality is managed such that there is no increase in salinity above 7,810 µS/cm (EC) (equivalent of 5,000 mg/L (TDS)) or the pre-disturbance baseline level, whichever is higher, within the Salinity Impact Area for the life of the Proposal and post-closure.<br><br>Trigger level and threshold contingency actions have been revised for all outcome based provisions to include clear response to reduce impacts including:<br>• Investigate to establish causal factors such as equipment error, sampling error, climatic influences, individual bore characteristics i.e., infrastructure capacity.<br>• Immediate cessation (within 24 hours) of aquifer injection at individual MAR bore(s).<br>• Reduce injection within the proximal MAR borefield.<br><br>And where practicable:<br>• Redirect excess water to alternate injection borefield within 24 hours.<br><br>In addition to Provision 1a and 1b above, HPPL have included measurable triggers and thresholds to ensure the following outcomes are achieved:<br>• Limit to the extent and magnitude of groundwater mounding from MAR. No. 2<br>• No indirect impact to vegetation health and terrestrial fauna habitat from groundwater mounding from the Project. No. 3<br>• No release of WRD leachate or contaminants from mining to groundwater and/or surface water. No. 4<br>• Limits on removal of likely stygofauna and troglofaunal habitat from mining. No. 5 |
| **Subterranean Fauna** | | |
| **19.** | There is an exceptionally high diversity of subterranean fauna, with at least 86 species of troglofauna and 150 species of stygofauna and the potential impacts to these species, particularly the restricted species, is likely to | **Subterranean fauna diversity** |

be significant. Appendix 26 of the ERD states that the project area 'contains richer subterranean communities than known from elsewhere in the Pilbara and supports numbers of stygofauna species, in particular, that would be considered globally significant.'

Six potentially restricted troglofauna species were identified as having a 'high' risk of being impacted (Table 8-10 of the ERD), as up to 70% of known habitat will be removed (Table 8-9 of the ERD). A targeted survey is proposed for 2025, but further detail on this survey is not clear.

While Appendix 9 infers that stygofauna habitat is potentially extensive and continuous based on several lithological units, it is not clear as to whether salinity gradients would act as a barrier and restrict the distribution of stygofauna species.

Improvements to management measures (e.g. a mining exclusion zone) may be required to ensure the protection of the restricted species and clearly show how potential impacts to a diverse subterranean fauna will be managed to meet EPA objectives.

The high number of restricted species/taxa stated in the supporting baseline reports by Bennelongia (as summarised in report 595) is understood to be the characteristic artifact of subterranean fauna sampling as well as a high number of specimens with poor taxonomic resolution. As stated in report 595, the number of subterranean fauna taxa recorded is strongly affected by HPPL's extensive sampling effort. Additionally, the authors (Bennelongia) acknowledge that the final number of subterranean fauna species in the report included duplicate species, the result of inconsistencies with data reconciliation. The duplicate species included the potential of up to six duplicate taxa for stygofauna and 15 duplicates taxa for troglofauna.

The diversity of the subterranean fauna at MDIOM is recognised as high. Comparison can be made with other recent projects in the Pilbara such as Brockman Syncline. From their survey data 124 troglofauna species/OTUs (operational taxonomic units) and 76 stygofauna species/OTUs were identified from 1,102 troglofauna samples (trap and scrapes) and 338 stygofauna samples. The Brockman Syncline subterranean fauna data had a higher number of OTUs through DNA barcoding.

In recognition of the inconsistencies and imitations of the data in report 595, a peer review of the subterranean fauna data, including the molecular analyses, was commissioned. The review was undertaken by Biologic in 2025 and included a reanalysis of the molecular data. The outcome of the review is an updated dataset which incorporates both morphological and molecular identifications, consistency with naming and final OTUs, which has been provided in the updated ERD.

The Biologic (2025) Peer Review of the Subterranean Fauna Survey Report 2019-2024 (Bennelongia 2024 report 595) is provided as Appendix 31 of the Updated ERD. This peer review provided a dataset with up to 109 troglofauna OTUs (2009 to 2024). The number of troglofauna in the 2019-2024 data was reconciled at 69 OTUs. A number of the taxa were assigned new OTUs. These were mapped to investigate their distribution within the areas of impact and presented in the risk assessment tables.

In terms of stygofauna, the combined results of all surveys (2009-2024), as presented in the updated dataset, yielded at least 173 stygofauna OTUs from 11,036 specimens since 2009-2024. From the 2019-2024 dataset, 146 stygofauna OTUs were confirmed from 8,644 specimens collected within the Proposal and in the adjacent landscape.

The updated dataset provides for greater consistency with naming and duplicates/uncertainties have been removed. For some taxa these have been replaced with "sp. indent" which has resulted in higher number of taxa/OTUs than the baseline surveys.

The work completed as part of the peer review allowed for a review of the risk assessment of the subterranean fauna.

**Troglofauna - Targeted Survey 2025**

AQ2 completed a subterranean fauna habitat assessment using Leapfrog Geo 3D modelling software to assess the extent, continuity and volume losses of geological units potentially habitable to troglofauna. Four potential troglofauna habitats were inferred in several lithological units within the Proposal. The units were found to be extensive and continuous over a wide area, with the Mineralised Marra Mamba occurring as discontinuous pods associated with mineralisation. The troglofauna which were considered as likely SREs were primarily in this habitat. To address this a targeted troglofauna survey was commissioned.

The 2025 targeted troglofauna survey was completed in July 2025. The laboratory analyses, including molecular analyses, are in progress with results expected in October/November 2025. This survey was commissioned primarily to understand the dispersal capabilities of SRE troglofauna which were found only in the Mineralised Marra Mamba habitat. The six taxa identified as potential restricted in the ERD Rev 4 were targeted in this survey. 73 scrapes/haul scrapes were collected and 60 traps were retrieved from the 62 deployed. The target area was the Mineralised Marra Mamba habitat where the proposed mine pits and the six restricted troglofauna were previously sampled. The survey also targeted the CID/Pisolite

and Undifferentiated Sediments habitat proximal to the pits. The drill holes where the restricted troglofauna were collected in the earlier surveys were also targeted. A high success rate for molecular analyses of samples is expected from this survey.

**Stygofauna – habitat (vertical)**

AQ2 completed a subterranean fauna habitat assessment using Leapfrog Geo 3D modelling software to assess the extent, continuity and volume losses of geological units potentially habitable to stygofauna. Potential stygofauna habitat was inferred in five geological units. The continuity and extent of these habitats across the MDIOM and in the broader landscape provides an understanding of the potential for dispersal of the stygofauna.

The AQ2 - Mulga Downs Iron Ore Mine – Revised Troglofauna Subterranean Fauna Habitat Assessment (presented in Appendix 9) states:

"*As documented in AQ2's Baseline Assessment Report (AQ2, 2024), hydraulic connection between the different lithological / hydrostratigraphic units is evident both laterally (from the groundwater level contours) and vertically (from the cluster bore data and limited clay / low permeability horizons). Vertical gradients (and reduced hydraulic connection) are only evident at a few cluster and paired bore locations where saprolitic clays or thin intervals of more clayey Tertiary materials are present. On an area wide scale, it is likely the valley aquifers are in vertical hydraulic connection, with local areas of separation caused by low permeability intermediating units (such as the saprolitic clay).*"

In 2025, AQ2 produced a block model which provided inferred baseline salinities at depth. The information from this model confirms there is no fragmentation as a result of any haloclines, and this was also stated in Bennelongia 2024a report. The area of likely stygofauna habitat was stated as up to30 mbgl. This depth is also defined in the EPA's Technical guidance for subterranea fauna sampling for EIA (2021), as the likely depth for stygofauna. In the aquifers at MDIOM, 40 mbgl the salinities noticeably increase which indicates a change in habitat and this habitat was considered unsuitable for stygofauna in the AQ2 (2024) habitat assessment.

The additional work which has been completed for the subterranean fauna also includes looking at the distribution of the stygofauna based on the statistical relationship between salinity and occurrence/absence records – at depth. This statistical analysis is complete and has been used in the development of the revised WMP. The final report is in preparation and is intended to be provided as Appendix 33 to the ERD. The information in this study has been applied to establishing appropriate triggers and thresholds for the stygofauna which have been applied in the WMP.

The additional work which was completed for this factor was commissioned to ensure the protection of any restricted taxa.

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**20.** Some taxa identifications in the ERD are inconsistent. For example, Palpigradi 'MH1' and Palpigradi sp. B18 are listed as separate taxa in Table 8-6 but use the same symbol in Figure 8.15. This should be clarified, and the distributions and risk rankings revised, as appropriate.

The updated subterranean fauna dataset provided by Biologic (2025) - *Peer Review of the Subterranean Fauna Survey Report 2019-2024 (Bennelongia 2024 report 595)* (Appendix 31) provides for greater consistency with naming and duplicates/uncertainties have been removed. For some taxa these have been replaced with "sp. indent" which has resulted in higher number of taxa/OTUs than the baseline surveys. The application of this updated dataset is discussed in Section 8.3.2 of the ERD and specifically in Section 8.3.2.8 Assessment of data

This updated dataset, including the number of subterranean taxa/OTUs, has been included in the updated subterranean fauna impact assessment (ERD Rev 5). Table 8-6 has been updated with the information in the updated dataset. The risk assessment includes the taxa Bennelongia (2024) categorised as restricted (Appendix 26) as well as any new OTUs which fall within the areas of impact. All figures have been updated to ensure the symbology reflects the information in Table 8-6.

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**21.** The risk rankings provided in the ERD for troglofauna (Table 8-6) and stygofauna (Table 8-7) do not have adequate justification for numerous taxa.

Tables 8-6 and 8-7 have been updated to provide greater justification on the rankings provided. These risk rankings are based on an updated dataset following the Biologic (2025) peer review and reconciliation of the data provided in report 595. The rationale for the risk ranking includes:

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| | Some taxa collected from a single site within the impact area were considered a 'low' risk (e.g. Draculoides 'MH2') while others are at 'moderate' risk (e.g. Draculoides 'SCH084-DNA). Table 8-6 and 8-7 should be reviewed for consistency. | • The extent of the direct impact (pit and/or mounding);<br>• The extent of habitat supporting troglofauna;<br>• The presence of barriers which may restrict the movement of troglofauna;<br>• The linear extent of taxa;<br>• The known ecological dependencies of the subterranean fauna;<br>• Reliability of identifications; and<br>• Currency and reliability of data (as defined by EPA (2021) *Technical Guidance – Subterranean fauna surveys for environmental impact assessment*).<br><br>The updated risk ranking has also considered the recent targeted troglofauna survey (sample processing underway). It was recognised that certain taxa could not be resolved and given this, these taxa were included in the 2025 targeted troglofauna survey. The validity of early identifications (such as with *Draculoides* MH2 collected in 2012 with little laboratory data to validate the taxonomy) was considered low. This was factored in the rationale along with the location of the specimen (i.e. was the habitat lost). However, to address any possible risks to SREs, including *Draculoides* MH2, the area (including the same sample hole) was resampled as part of the 2025 targeted troglofauna survey. All tables, including Tables 8-6 and 8-7, have been reviewed for consistency in the updated ERD. A figure showing the location of the survey sites in relation to the potential SRE troglofauna is provided in Attachment 2, Figure 5. |
| **22.** | Further detail should be provided on the post-backfill troglofauna recolonisation study as committed to in the Subterranean Fauna Monitoring and Management Plan (SFMMP), including detail on survey timing and methodology. | This study is no longer considered as a mitigation measure and will not be undertaken. The WMP includes outcome and objective based provisions for the subterranean fauna. |
| **23.** | Further detail should be provided on the management measures for subterranean fauna.<br><br>In the WMP, groundwater level and salinity threshold criteria have not been finalised. The use of 'interim' trigger and threshold criteria is not supported, as the trigger and threshold criteria should be based on the protection of ecological values.<br><br>The use of 'agreed on case-by-case basis with stakeholder' (Table 3-1 of the WMP) does not provide confidence that the chosen water quality criteria has adequately considered potential impacts to subterranean fauna. Appropriate salinity thresholds should be proposed based on local conditions and salinity tolerances of restricted species.<br><br>The WMP proposes quarterly salinity monitoring (Table 3-1). Monthly monitoring is recommended for cases, such as this, where there is a potentially high risk of impacts to subterranean fauna.<br><br>The same salinity trigger criteria (4,500 mg/L) is proposed for all monitoring bores, despite initial conditions varying across the development envelope. Salinity trigger and thresholds should be specific to local conditions and take into consideration the tolerance of stygofauna species present. Changes to groundwater quality should be avoided in areas where restricted stygofauna species are present.<br><br>It is not clear if there is likely to be any other risks from changes to groundwater quality, aside from increased salinity (e.g. increased concentrations of contaminants). This should be clarified, and if elevated concentrations are expected, appropriate trigger and threshold criteria should be proposed. | The management measures for subterranean fauna are based on the risk to the subterranean fauna from implementation of the Proposal.<br><br>Management measures have been provided for troglofauna and stygofauna in the WMP. The management measures include the extent of habitat loss and the potential impacts from changes in groundwater salinity. The changes are predicted to be up to 7,031 µS/cm (equivalent to 4,500 mg/L TDS) within the areas shown as "predicted salinity extent" in the stygofauna Figures 8.4, 8.17 and 8.19 of the ERD. This extent is also presented in Figures 8.20 and 8.21.<br><br>The WMP has been updated to include salinity thresholds which have considered the conditions at MDIOM and are more specific to stygofauna. The information on the salinity thresholds has been modelled for SRE stygofauna. These stygofauna were selected based on their known linear ranges, including whether they were singletons. The relationship between the SRE stygofauna and salinity have been investigated using statistical analyses and incorporates the inferred baseline salinity data. As stated in the EPA *Technical guidance for subterranea fauna sampling for EIA* (2021), collection of stygofauna samples is limited to the use of haul nets which collect samples throughout the water column. As such, in an unconfined aquifer the associated salinity value with the specimen is unclear. To address this, HPPL have adopted a salinity model (AQ2) which has generated the inferred baseline salinity at various depths.<br><br>The habitat which was identified as likely to support stygofauna is considered as being continuous.<br><br>As stated in the 3D habitat assessment:<br><br>*"As documented in AQ2's Baseline Assessment Report (AQ2, 2024), hydraulic connection between the different lithological / hydrostratigraphic units is evident both laterally (from the groundwater level contours) and vertically (from the cluster bore data and limited clay / low permeability horizons). Vertical gradients (and reduced hydraulic connection) are only evident at a few cluster and paired bore locations where saprolitic clays or thin intervals of more clayey Tertiary materials are present.* |

*On an area wide scale, it is likely the valley aquifers are in vertical hydraulic connection, with local areas of separation caused by low permeability intermediating units (such as the saprolitic clay).*"

***Application of appropriate salinity thresholds/water quality criteria***

Statistical analyses were applied to establish the relationship between key stygofauna species and salinity and inform the development of triggers and thresholds for the stygofauna functional groups to mitigate the impacts from changes to groundwater salinity. This study is presented in Appendix 33.

The variation in conditions across the landscape has been investigated using the output of a block model which presented the inferred baseline salinity values at depth.

The extent of the predicted salinity changes as a result of MAR is now shown in Figures 8.4, 8.17 and 8.19. This extent is also presented in Figures 8.20 and 8.21.

The area of occurrence of the SRE stygofauna is also presented indicating the species which may be at risk from changes in salinity, if they were considered to be restricted. The stygofauna considered at risk from the Proposal were re-assessed using the information from the updated dataset (Biologic 2025). The rationale for the risk assessment was the same as the troglofauna (as stated in item 21) and is discussed in Section 8.3.2.8 - Assessment of Data.

The WMP has been updated and includes the monitoring for changes in water quality triggers and thresholds set for the stygofauna. The habitat (aquifers) found to be suitable for stygofauna mitigate the potential for SREs located only within the area of predicted salinity changes. These aquifers have been found to be contiguous and extend beyond the areas of impact. This is also displayed in the distribution of the stygofauna and discussed in Section 8.3.4.4.

The updated information from this additional work undertaken since the public review period, and any planned future work, is included in the updated ERD. All revisions and new analyses are based on the reconciled subterranean fauna dataset discussed in Item 19 In addition, all figures now include the predicted extent of salinity changes to better display areas of impact.

Given Tailings Storage Facilities are no longer required for this Proposal, contamination from tailings is not considered a risk. Potential Acid Forming material and leaching from Waste Rock Dumps is also considered negligible as outlined in the ERD.

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**24.** The ERD (page 278) describes that salinity tolerances were established using formal methodology. However, the Response to EPA comments (dated 1 April 2025) describes the desktop assessment as observational, and that additional studies will be conducted. The commitment for additional studies does not appear to be included in the SFMMP or ERD, and this should be clarified.

At the time of submission, the additional studies for salinity had not been commissioned. The additional work to better inform the potential impact to stygofauna from changes in salinity include:

- Biologic (2025) Peer Review of the Subterranean Fauna Survey Report 2019-2024 (Bennelongia 2024 report 595) (Appendix 32);
- JBS&G (2025) Analysis of stygofaunal associations with groundwater salinity and potential salinity tolerances based on observations, for the MIOIM (in progress) (Appendix 33)
- Additionally, the Salinity Tolerance Memo (Memo 675: Salinity Tolerance of Stygofauna at Mulga Downs Iron Ore Mine (Bennelongia 2024) was peer reviewed at the request of the EPA (Appendix 31).

While the peer review confirmed the methodology was appropriate, it also noted that the salinity data was limited to measurements from the top 1 metre (mbgl) of the groundwater column. The peer review is provided as Appendix 31.

Since the RFI (April 2025) statistical analyses have been completed investigating the relationship between key stygofauna species / functional groups and salinity (using the inferred baseline salinity at varying depths (up to 30 mbgl). The output from this study - JBS&G (2025) *Analysis of stygofaunal associations with groundwater salinity and potential salinity tolerances based on observations, for the MIOIM* has informed the establishment of triggers and thresholds for the

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| | | stygofauna (the focus on potential SREs). This analysis is applied to the WMP to ensure salinity triggers and thresholds protect at risk stygofauna. |
| **25.** | The stygofauna peer review (dated 28 March 2025) was provided as an attachment to the Response to EPA comments document (dated 1 April 2025). It is unclear if the conclusions from this peer review have been fully incorporated into the ERD and SFMMP, and whether a revision to the stygofauna habitat assessment (Appendix 22 of the ERD) is proposed.<br><br>It is noted that stygofauna peer review considered that Appendix 22 was a 'useful starting point,' and that further clarification is required for salinity tolerances of stygofauna in the area. This is particularly important as the ERD identifies that stygofauna habitat quality is predicted to decline, with a salinity range to vary between 1,800 mg/L and 3,000 mg/L (page 289), while eight stygofauna had an inferred salinity tolerance below 1,000 mg/L (page 299).<br><br>The stygofauna peer review should be provided for publication on the EPA website as part of the Response to Submissions. | The conclusions in the Biologic (2025) – *Peer review of Salinity tolerance of stygofauna at Mulga Downs Iron Ore Mine. Memo 675)* (Appendix 31) have been considered in the statistical analyses (in JBS&G 2025) and include:<br><br>• Understanding the potential for different stygofauna species to occupy different salinity niches throughout the vertical profile.<br>• The method of water quality (WQ) sampling bias; the data measuring only the superficial WQ.<br>• Understanding the deeper aquifer conditions, recognising that the WQ conditions sampled at the top of each bore may not reflect the entire water profile.<br>• The WQ measured from the bailer is not necessarily related to the stygofauna 'presence' in a net sample (which could be collected anywhere throughout the vertical profile of a bore / hole).<br>• The taxonomic uncertainty and paucity of information surrounding water quality compounds the issues around inferring 'species tolerances'.<br><br>The analyses investigating the relationship between stygofauna and salinity at MDIOM considers the above points. This information has been applied to then WMP in establishing thresholds which consider conditions within the aquifers at MDIOM.<br><br>One of the comments was the issue with taxonomic resolution. This was addressed with the provision of an updated reconciled dataset. There is now greater consistency in the naming of the subterranean fauna following the Biologic peer review of the data in report 595. The updated data set now informs the subterranean fauna impact assessment. For example, one of the taxa identified as *Areacandona* BOS1381 was defined as restricted, this was based on poor resolution. A review of the other Plocopoida found a number of other ostracods did not reflect the naming provided.<br><br>The Biologic peer review of the salinity memo 675 is available to be published as part of the Response to Submissions and is presented as Appendix 31. |
| **26.** | While useful to inform impact assessment, data sharing with other companies would not be considered a mitigation measure, as referenced in section 8.4.3.1 of the ERD. This should be clarified. | Data sharing has been removed as a mitigation measure. |
| **Terrestrial environmental quality** | | |
| **27.** | It is noted that the pit designs have deliberately avoided the Jeerinah Formation to avoid carbonaceous shales and as such, risks associated with the carbonaceous shales have not been addressed. If this unit is proposed to be mined in the future, additional consideration will be required and should be clarified. | The risk of exposing Jeerinah Formation shale is discussed in the Waste Characterisation reports, and samples of this material were collected during the geochemical characterisation programme. While not all material from this unit is high in sulfide minerals, the risk of acid generation and metalliferous drainage is significant and does not meet ALARP principles. Additionally, the basal unit of the Nammuldi member conformably overlies the Jeerinah Formation, can have many of the same properties and can be indistinguishable. As a result, both the basal unit of the Nammuldi Member and the Jeerinah Formation have been specifically avoided in pit design, as, the best practice for potentially acid forming rock, is to leave it in the ground undisturbed.<br><br>However, in practical terms, the base of mineralisation and the pits is 10s of metres above these units and the risk of intersection is low. The Jeerinah Formation and basal Nammuldi member does not contain mineralised iron ore, and will never be proposed to be mined.<br><br>Additionally, all iron mineralisation and associated pit designs are generally located above the base of complete oxidation and as such are highly unlikely to intercept any fresh (unoxidised), sulphide bearing or carbonaceous shale units. |

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| | | If any potentially acid generating material is unexpectedly disturbed during mining, this contingency will be managed under the WRMP.<br><br>HPPL notes that if this unit is to be mined in the future, additional consideration will be required and addressed at that time and not conducted under this Proposal. Table 11-8 notes this geology will be avoided. |
| **28.** | The presence of natural asbestiform minerals has not been adequately addressed.<br>Additional detail should be provided on the potentially for naturally occurring asbestiform to occur within mine pits given the detection during the exploration drilling program within the Malaya Well tenement. | The Wittenoom Asbestos Management Area (WAMA) overlaps with the eastern portion of the Malay Well tenement (E47/2117), and windblown fibres from this area may occur on the surface. Additionally, the area north of the development envelope was assessed in HPPL Asbestiform Minerals and Asbestos Containing Material, Preliminary Environmental Site Assessment Mulga Downs Iron Ore Mine and Borefield Mulga Downs Station, Pilbara, Western Australia, 2023 Reports No. 54533/147,801 (Rev 0) JBS&G.<br><br>The Malay Well tenement does not form part of this proposal and occurs south of the Mulga Downs Development Envelope within the Fortescue Valley and heritage area and no ground disturbance is proposed to take place on this prospect.<br><br>While asbestos risk is widespread in the Pilbara, the iron ore mineralisation at Mulga is located in highly oxidised material which reduces the risk of fibrous material occurring. Drilling personnel are trained to identify any fibrous material intersections and occurrences are recorded and treated according to safe working practice. The Mulga Downs area has been extensively drilled and to date no Asbestiform Containing Materials have been detected (confirmed by SEM analysis) at the Mulga East tenement.<br><br>Air fibre monitoring is conducted to monitor the risk to workers.<br><br>The Mulga operations will follow the WA State Government DMP Guideline on the Management of Fibrous Minerals, WorkSafe Guidelines, as well as the Asbestos Management Plan. |
| **Social surroundings** | | |
| **29.** | The proposed post-mining land use as described in the MCP is to return the development envelope to pasture and cattle grazing. However, it is not clear if this has included consideration of consultation with the Traditional Owners on the design of final landforms.<br><br>Given the presence of significant flora and vegetation, terrestrial fauna, inland waters, subterranean fauna, and social surroundings values, it is expected that further consideration is given to applying DMIRS (2023) guidelines and reinstating the land to a 'natural' ecosystem, where possible. | The Traditional Owners are a key stakeholder to the Project, as such it is important to understand and manage expectations and work to mitigate the risk of direct impacts related with the Mine.<br><br>HanRoy is committed to preparation of a Mining Development and Closure Proposal (MDCP) and subsequent Mine Closure Plan (MCP) in accordance with the Mining Act 1978 and Mining Regulation 1981.<br><br>The DEMIRS guidance for preparing MCPs (DEMIRS, 2025) is consistent with industry leading best practice and is based on the principle that planning for mine closure be an integral part of mine development and operations planning.<br><br>DEMIRS recognises that closure planning is a progressive process and that MCPs are evolving documents which undergo ongoing review, development, and continuous improvement throughout the life of mine.<br><br>DEMIRS also recognises that not all technical information will be available at the early stages of development, however knowledge gaps relating to closure specific matters are expected to be identified in the MDCP and further refined and addressed in the MCP.<br><br>As part of ongoing key stakeholder engagement, HPPL has requested of, and is working with the Traditional Owners to undertake collaborative risk assessment and mine closure workshops for the Project and provide them the opportunity to review and comment on the informed draft MDCP and subsequent MCP prior to submission to DEMIRS.<br><br>It is expected that the MCP will demonstrate, based on reliable science-based and site-specific information, that ecologically sustainable closure can be achieved. |

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| **30.** | Section 14.5 of the ERD notes that proponent will undertake ethnobotanical surveys and include the results and subsequent management measures in the SCHMP. The timing of these surveys is not clear, and the commitment to undertake these surveys should be included in the SCHMP. | HPPL completed an ethnobotanical survey with Banjima representatives in 2024 and will include the commitment to undertake additional ethnobotanical survey within an SCHMP, as required. This commitment will include details for the proposed survey timing (in consideration of Traditional Owner availability). |
| **Greenhouse** | | |
| **31.** | Further information is required on the expected greenhouse gas emissions attributable to the proposal.<br><br>Further quantitative detail should be provided on the emissions estimates, including the quantity of emissions from key emissions sources, including transport related emissions.<br><br>Figure 12-1 of the ERD presents the overall emissions estimates for the proposal, however, the associated numerical data should be provided in a table form to assist with interpretation and inform the EPA's assessment.<br><br>Estimates should be provided on the quantity of offsets expected to be required per year, and across the life of the proposal. These estimates should also be provided as a percentage of baseline scope 1 emissions.<br><br>Consistent with EPA (2024a) information should be provided on whether offsets are likely to be available, and whether they satisfy the relevant offset integrity principles. | HPPL have undertaken a review of the greenhouse gas emissions attributable to the proposal and in line with the most update to date fuel use data (from the Mulga Downs Mine Feasibility Study).<br><br>The ERD has been updated to include a breakdown of emissions by key source including:<br><br>• Emissions from Mining;<br>• Emissions from Power Generation;<br>• Emissions from Transportation of Ore (inclusive of road haulage to Hillside Siding and rail haulage to Port Hedland);<br>• Vegetation Clearing (loss of biosequestration)<br><br>Figure 12-1 has been updated and numerical data has been included within the ERD (new table 12-5).<br><br>HPPL have included additional detail regarding availability and integrity of offsets to the ERD (Section 12.3.1.3). Should the HPPL need to use offsets, they will be offsets that are issued under recognised carbon offset programs. Such programs include:<br><br>• Australian Carbon Credit Units issued under the Carbon Credits (Carbon Farming Initiative) Act 2011 (Cth).<br>• Safeguard Mechanism Credits issued under the Safeguard Mechanism (Crediting) Amendment Act 2023.<br>• Verified Emission Reductions issued under the Gold Standard program.<br>• Verified Carbon Units issued under the Verified Carbon Standard program.<br>• Carbon offsets issued under the Climate Action Reserve program.<br>• Carbon offsets issued under the American Carbon Registry program.<br>• Other offset units that are issued under similarly recognised programs.<br><br>HPPL has reviewed the availability of carbon offsets that may be required to meet emissions limits should other mitigation measures prove insufficient. Based on recent advice from financial institutions and carbon market intermediaries, there is a well-established and liquid market for Australian Carbon Credit Units (ACCUs), Safeguard Mechanism Credits, and a range of internationally recognised offset units, including those issued under the Gold Standard, Verified Carbon Standard, Climate Action Reserve, and American Carbon Registry programs. For example, for just the ACCU market, in 2024 there was 50 million ACCUs in the market, with 18.8 million being issued that year.1 This more than meets the potential amount of offsets that the Proponent would need to buy.<br><br>Offsets from these programs are widely accepted and recognised for compliance purposes in Australia and internationally. HPPL has previously purchased ACCUs to meet compliance obligations and, based on current market advice, expects that sufficient supply will be available to meet future requirements. Should offsets be required, the Proponent will purchase units from these recognised programs.<br><br>HPPL understands that offsets purchased from the above-mentioned programmes—such as ACCUs, Safeguard Mechanism Credits, Gold Standard Verified Emission Reductions, Verified Carbon Units under the Verified Carbon Standard, Climate |

[1] https://cer.gov.au/markets/reports-and-data/quarterly-carbon-market-reports/quarterly-carbon-market-report-december-quarter-2024/safeguard-and-australian-carbon-credit-unit-accu-schemes#:~:text=Overall%20ACCU%20market%20liquidity%20looks,Supplementary%20figures

Action Reserve credits, and American Carbon Registry credits—are issued under established regulatory frameworks and are subject to an assessment processes. These programmes are recognised for their robust governance, transparency, and independent third-party verification.

Offsets from these schemes are designed to meet key integrity principles, including additionality (ensuring emissions reductions are above business-as-usual), permanence, avoidance of double counting, and regular monitoring and reporting. In Australia, the Clean Energy Regulator and the Emissions Reduction Assurance Committee oversee the integrity of ACCUs, while international standards such as Gold Standard and Verra (VCS) are governed by respected non-profit organisations with strong reputations for environmental and social safeguards.

Accordingly, HPPL understands that purchasing offsets from these recognised programmes provides assurance that the units are consistent with the relevant offset integrity principles as required by the EPA and other regulatory bodies.

**32.** Further information should be provided on how the proposal is likely to interact with the Safeguard mechanism.

The ERD does not provide sufficient detail or explanation why the proposal is unlikely to be covered under the Safeguard mechanism.

Consistent with EPA (2024a), information should be provided on best practice analysis and benchmarking of emissions intensity. This should include a comparison against best practice production variables as referenced under the Safeguard mechanism.

HPPL have included additional information in the ERD (Section 12.3 Safeguard Mechanism Confirmation). The Proposal is unlikely to be classified as a Safeguard Facility under the Safeguard Mechanism. Consistent with other operations in the Pilbara—such as those managed by Atlas Iron—road haulage and mining activities are treated as separate facilities under the National Greenhouse and Energy Reporting Scheme (NGERS). Under NGERS, facilities are defined and reported based on operational control, which is determined by the entity with the authority to make key decisions regarding safety, employment, and operational procedures.

For road haulage, operational control rests with the road haulage contractor, who is responsible for the trucks, drivers, and associated safety and operational systems. The Proponent does not intend to have ultimate authority over the management or operation of these vehicles or personnel. In contrast, for mining activities, operational control is held by the entity listed with the Department of Energy, Mines, Industry Regulation and Safety (DEMIRS) as having responsibility for safety on the mining lease—it is intended that this will be the Proponent.

Accordingly, emissions from road haulage and mining are reported separately under NGERS, and only the facility under the Proponent's operational control (i.e., the mining activities) would be considered in any Safeguard Mechanism assessment. Based on current and forecasted emissions, the Proponent's mining facility is not expected to exceed the Safeguard Mechanism threshold.

In addition, the Proponent will not exceed 100,000 t CO2-e of overall project emissions due to the application of the mitigation hierarchy.

Emissions intensity data has been used to benchmark GHG emissions from the Mulga Down Project against other iron ore mines, i.e. tonnes of GHG emitted per tonne of iron ore mined. The iron ore mines considered for benchmarking are similar facilities located in the Pilbara region with publicly available information about their Scope 1 emissions.

Emissions intensity is calculated by:

***Emissions intensity = Scope 1 emissions / Production rate***

**Scope 1 Emissions:** Forecast Mulga Down annual Scope 1 emissions (those emissions emitted within the mining lease) = 84,449 $tCO_2$-e

**Production Rate:** Forecast Mulga Down iron ore production per annum = 12,000,000 tpa

Mulga Down emissions intensity = 0.007037 $tCO_2$-e/t iron ore.

HPPL have included a new table within the ERD benchmarking the Projects emissions intensity with other iron ore mines currently operating in the Pilbara region (Table 12-2).

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| **33.** | The greenhouse gas emissions estimates in the Proposal Content Document (dated 12 September 2024) do not align with those presented in the ERD. For example, the construction scope 1 emissions peak annual average is listed as up to 73,484 tonnes carbon dioxide equivalents (t CO2-e). However, based on Figure 12-1 of the ERD, vegetation clearing will result in a loss of over 100,000 tonnes t CO2-e. Further, the Proposal Content Document states that the peak annual average for operational scope 1 emissions will be up to 206,919 t CO2-e, however, the ERD states that net emissions will not exceed 100,000 t CO2-e per annum. The Proposal Content Document should be revised under s.43A of the Environmental Protection Act 1986 to ensure consistency with the ERD and with anticipated greenhouse gas emissions. | HPPL are currently preparing a s43A application under the EP Act to ensure consistency between anticipated GHG emissions in the Proposal Content Document and Environmental Review Document. |

**General comments**

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| **34** | The ERD lists proposed environmental outcomes (e.g., section 9.8), which are the approach preferred by the EPA. However, these outcomes have not been reflected in the CSFMP. Instead, they have been translated into as objective-based provisions in Table 2-2 (e.g., 'minimise impacts to conservation significant fauna'). | The outcome "No introduction of new environmental weed species within the Development Envelope as a result of Proposal activities" is an outcome that HPPL is committed to. The use of this outcome in the CSFMP however needed to be transcribed to determine how this outcome would relate to conservation significant fauna and the habitats that support them. The resulting objective-based provision is as follows "No adverse impacts to conservation significant fauna due to the introduction and/or spread of weeds as a result of the Proposal." The management actions that contribute to meeting this target build on practises that are currently in use at other HPPL associated operations in the Pilbara (i.e. McPhee Creek, Roy Hill).<br><br>Where additional environmental outcomes that relate to conservation significant fauna have been added/changed in the CSFMP, they have been replicated in the environmental outcomes for terrestrial fauna (Table 10-16). |
| **35** | It is recommended that the WMP, SFMMP, and CSFMP are combined into one management plan to ensure all relevant information is contained in a single document. This will ensure that outcome and objective-based provisions that are relevant for more than one factor, such as water quality criteria for inland waters and subterranean fauna, are in the one location for improved efficiency. | As recommended, HPPL have combined the outcomes of the Water Management Plan (WMP) and Subterranean Fauna Monitoring and Management Plan (SFMMP) into an updated version of the WMP. This has reduced the duplication of provisions that are relevant to multiple environmental factors.<br><br>While the WMP does include consideration for vegetation health as fauna habitat and Matters of National Environmental Significance (MNES) i.e. Clay Pans as habitat for listed migratory species, HPPL have kept a stand-alone Conservation Significant Fauna Management Plan (CSFMP) document as the provisions are for the most part, not related to potential ecohydrological impacts. |
| **36** | It is noted that some areas of the development envelope extend beyond the boundary of suitable tenure (M47/1621, L45/380, L45/384). The portion of the development envelope directly north of E 47/4748 is on tenure not held by Hancock Prospecting. | HPPL is aware of the *Mining Act 1978* tenure constraints and will not undertake any ground disturbing activities prior to grant of appropriate tenure and approval of proposed activities. |

**References (EPA)**

Biota Environmental Sciences (Biota) 2018, Eliwana consolidated detailed flora and vegetation phase 2. Available from: https://www.epa.wa.gov.au/proposals/eliwana-railway-project.

Environmental Protection Authority (EPA) 2024a, Environmental Factor Guideline: Greenhouse Gas Emissions, EPA, Western Australia.

EPA 2024b, Instructions: How to prepare Environmental Protection Act 1986 Part IV environmental management plans, EPA, Western Australia.

Fortescue Metals Group (FMG) 2023, Supporting Document – East Hamersley Railway Project s38 Referral. Available from: https://www.epa.wa.gov.au/proposals/east-hamersley-railway-project.

Pinder, AM, Lyons, ML, Collins, M, Lewis, L, Quinlan, K, Shiel, RJ and Coppen, R 2017, Wetland Biodiversity Patterning Along the Middle to Upper Fortescue Valley (Pilbara Region: Western Australia) to Inform Conservation Planning. Department of Biodiversity, Conservation and Attractions, Western Australia.

Department of Mines, Industry Regulation and Safety (DMIRS) 2023, Mine Closure Plan Guidance - How to prepare in accordance with Part 1 of the Statutory Guidelines for Mine Closure Plans, Department of Mines, Industry Regulation and Safety.

## The Proposal – General Comments

| Item | Submitter | Submission and/or issue | Proponent Response |
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| **1** | NON-W8X1-NPA4-B | The proponent has not adequately addressed post-closure impacts. Clear management measures should be provided to ensure rehabilitation efforts are sufficient. | HPPL have included provisions for monitoring impacts to groundwater, surface water and vegetation health (and fauna habitat) post-mining within the updated WMP and CSFMP.<br><br>HPPL is also committed to preparation of a Mining Development and Closure Proposal (MDCP) and subsequent Mine Closure Plan (MCP) in accordance with the *Mining Act 1978* and *Mining Regulation 1981*.<br><br>The DEMIRS guidance for preparing MCPs (DEMIRS, 2025) is consistent with industry leading best practice and is based on the principle that planning for mine closure be an integral part of mine development and operations planning.<br><br>DEMIRS recognises that closure planning is a progressive process and that MCPs are evolving documents which undergo ongoing review, development, and continuous improvement throughout the life of mine.<br><br>DEMIRS also recognises that not all technical information will be available at the early stages of development, however knowledge gaps relating to closure specific matters are expected to be identified in the MDCP and further refined and addressed in the MCP.<br><br>It is expected that the MCP will demonstrate, based on reliable science-based and site-specific information, that ecologically sustainable closure can be achieved. |
| **2** | ANON-W8X1-NPA4-B | The proposal has the potential to have significant impacts on values of the Fortescue River/Fortescue Marsh, including groundwater drawdown, reduction in habitat for wildlife provide important refuge for wildlife, particularly in dry conditions. | The ERD outlines the environmental impact assessment undertaken for the Proposal and the level of significance of impact resulting from the Proposal.<br><br>This includes consideration and management of potential impacts to sensitive receptors within and proximal to the Development Envelope. |
| **3** | ANON-W8X1-NPA3-A | General concern that sufficient management measures have not been proposed, and that residual impacts cannot be managed to meet the EPA's objective for flora and vegetation, inland waters, subterranean fauna, and social surroundings. | HPPL have reviewed and updated the Environmental Review Document (ERD), Water Management Plan (WMP) and Conservation Significant Fauna Management Plan (CSFMP) in response to the EPA Services and Public comments. Management actions for inland waters, flora and vegetation, subterranean fauna and social surrounds have been revised.<br><br>The ERD details residual proposed impacts and where these are considered significant, an offset is proposed. Mitigation measures proposed are considered sufficient to meet the principles contained in the EP Act and the EPA's objectives for individual factors. |

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| **4** | ANON-W8X1-NPA3-A | The proponent does not have sufficient monitoring of impacts to flora and vegetation and subterranean fauna values outside the development envelope. It is also not clear if the proponent has access to tenure outside the development envelope to conduct this monitoring. | The WMP has been updated to include additional detail for the groundwater, surface water, vegetation health and subterranean fauna monitoring programs.<br><br>A number of miscellaneous licences applications under the Mining Act 1978 (WA) are in place to ensure ongoing access to existing and identified future monitoring bore locations which are outside of the Development Envelope. Additional monitoring bores are located on existing exploration tenure held by HPPL related entities (i.e. Mulga Downs Iron Ore Pty Ltd) surrounding the Development Envelope. Where access is required beyond the life of the exploration licences or associated approvals, or if additional monitoring bores are required, additional miscellaneous licences may be sought.<br><br>For other surveys, observations and non-ground disturbing monitoring required to be undertaken off-tenure, remote sensing methodologies may be employed or permission will be sought from underlying tenure holders, which is common practice for regional environmental monitoring. Established processes are in place with adjacent tenure holders in areas surrounding the Development Envelope for access for monitoring purposes.<br><br>It is considered most appropriate to undertake such monitoring within tenure where possible such that HanRoy has control over the longevity of the monitoring sites (i.e. a third party cannot develop in that location). If any additional monitoring requirements or monitoring locations are identified outside of tenure over the life of the Proposal, HPPL (or a related party) will submit an application for Miscellaneous licence under the Mining Act to ensure ongoing access. |
| **5** | ANON-W8X1-NPA3-A | The submitter considers that further clarity and confirmation should be provided on the potential for the Pilbara Environmental Offsets Fund to adequately offset residual impacts. | HPPL has followed the requirements of the EPA and submitted an 'Impact Reconciliation Procedure' (IRP) as an appendix to the ERD (Appendix 23). The IRP outlines the method used to calculate the significant residual impact that would occur on implementation of the Proposal. The EPA will review this method and determine if the calculations provided are respective of the impacts. Should the Proposal and the IRP be approved, implementation of the IRP will be a condition of the Ministerial Statement. Once conditioned, HPPL will be liable for payments to the PEOF over the life of the Proposal.<br><br>The PEOF acknowledges the complex nature of land rights, tenure and interests in the Pilbara bioregion and provides a framework to navigate these complexities. The PEOF has been designed collaboratively with Traditional Owners and other land managers to optimise the benefits of the fund. The fund is forecast to deliver more than $90 million of projects over the next 40 years. Projects funded by the PEOF will be delivered at different scales; landscape-scale programs, priority area programs and site-specific programs. The development and execution of programs is advised by the PEOF implementation advisory group, with the Minister for Environment ultimately selecting the programs that will be receive funding and move to delivery. The PEOF fund can be used to delivery legislation change and land tenure reform, ensuring the implementation of long term security for impacted species.<br><br>In addition to the IRP and PEOF contributions, HPPL will implement the Conservation Significant Fauna Management Plan (CSFMP). The CSFMP will manage the impacts on conservation significant terrestrial fauna, both direct and indirect impacts. HPPL is currently defining the specifics of these management actions and are looking to co-design and implement these actions with appropriate land managers (i.e. DBCA) and subject matter experts. |
| **6** | ANON-W8X1-NPA3-A | The reference list is incomplete. | The reference list has been updated in the revised ERD. |

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| **7** | ANON-W8X1-NPA3-A | The submitter notes that the Environmental Scoping Document for the MDIOM states that an objective-based management plan for subterranean fauna will be developed, however, an outcome-based plan has been developed. | HPPL have developed an updated WMP that includes outcome-based provisions for management of impacts to subterranean fauna.<br><br>Outcome-based EMPs are performance-based and focus on monitoring and evaluating specific measurable environmental outcomes and are typically driven by trigger and threshold criteria. This form of EMP provides measurable and specific environmental outcomes and allows for evolving management practices as information is obtained. In this instance, an outcome-based plan is considered more appropriate than an objective based management plan to ensure measurable criteria. The draft plan will require approval of the CEO prior to implementation and the EPA will therefore assess whether the plan meets the requirements of the ESD. |

## Flora and Vegetation

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| 8 | ANON-W8X1-NPAG-X<br><br>ANON-W8X1-NPA3-A | Sufficient management measures have not been proposed to address the potential impacts from dust emissions on vegetation health. | The vegetation health monitoring program detailed within the updated WMP includes consideration of impacts to vegetation from dust emissions as a 'General site condition' variable for assessment of impacts from the Project.<br><br>Management of dust suppression activities is outlined in Table 9-15 of the ERD and include:<br><br>• Sealing of the Northern Haul Road will avoid dust emissions generated along the approx. 36 km haulage route to the Great Northern Hwy. Subsequently, this avoids the need to use water along this route for dust suppression.<br><br>Dust control measures will be implemented throughout the life of the Proposal and will include:<br><br>• Saline water (> 5000 mg/L TDS) shall not be used for dust suppression.<br>• Dust suppression techniques (e.g. water trucks) shall be used on unsealed roads and access tracks, cleared areas and at locations of high dust risk.<br>• Vehicle speeds on haul roads, work and camp sites shall be reduced where necessary to minimise dust emissions.<br>• Vegetation clearing and earthworks during high winds (>50 km/hr) shall be avoided.<br>• Clearing activities will be staged to minimise areas of exposed surfaces.<br><br>The above measures are considered sufficient to ensure potential impacts on vegetation are managed.<br><br>The Pilbara region of Western Australia is characterized by a semi-arid climate. Concerns have previously been raised about the ecological impacts of dust emissions from mining activities, particularly regarding vegetation health. The findings of Matsuki et al. (2016), which report no significant negative impacts of dust deposition on plant health in semi-arid environments, are considered relevant to the Pilbara because the environmental conditions in the Pilbara—low annual rainfall, high temperatures, and sparse vegetation—mirror those of the semi-arid environments studied in their work. Their findings suggest that plants in such regions may exhibit a degree of resilience or adaptation to intermittent dust deposition.<br><br>In addition, local flora—such as spinifex grasses and acacias—are known to have evolved mechanisms to tolerate harsh environmental conditions, which may include periodic dust accumulation on leaves and stems. |
| 9 | NON-W8X1-NPA4-B | The vegetation proposed to be cleared is excessive. | HPPL acknowledge the extent of clearing proposed for the Mulga Downs Iron Ore Mine.<br><br>The Proposal extent is a Development Envelope of 16,848.53 hectares (ha) within which up to 4,339.16 ha of vegetation will be cleared.<br><br>The Proposal has been developed through a detailed process of review to ensure impacts to the environment are minimised through application of the mitigation hierarchy.<br><br>HPPL is using existing environmental data for the region supplemented with site specific baseline and targeted data collected through the completion of the following studies:<br><br>• Flora and vegetation;<br>• Ecohydrological;<br>• Terrestrial fauna including short range endemics;<br>• Subterranean fauna;<br>• Surface and groundwater;<br>• Air quality;<br>• Noise; |

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| | | | | • Visual assessments;<br>• Heritage and Social Surrounds; and<br>• Soil and Materials characterisation.<br><br>To inform the design of the Proposal and modifications to the Development Envelope and Indicative Footprint to avoid and minimise impacts to high value areas, where practicable. |
| 10 | ANON-W8X1-NPA3-A | The proponent has not proposed sufficient management measures to mitigate the residual impacts to priority flora, and in particular, the Priority 1 species Hibiscus sp. Mulga Downs (S. Hitchcock SH 638) and Triodia veniciae.<br><br>As described in Appendix 10d of the ERD, any known records of the Hibiscus sp. Mulga Downs (S. Hitchcock SH 638) should be avoided. Further, the proposal will directly impact 2,9973.5 ha of sheetflow dependent vegetation, 30.6% of the sheetflow-dependent vegetation within the development envelope, which will reduce available habitat for the Hibiscus sp. Mulga Downs (S. Hitchcock SH 638).<br><br>Clearing of 49.5% of the known records of Triodia veniciae within the development envelope represents a significant residual impact.<br><br>Further evidence should be provided to show that the proposal has been designed to mitigate impacts to priority flora species.<br><br>It is noted that the FHEZ is referenced in Table 9-15 of the ERD as an avoidance measure, however, the FHEZ does not appear to have any priority flora were recorded within it. | HPPL have reviewed and updated the Environmental Review Document (ERD), Water Management Plan (WMP) in response to the EPA Services and Public comments. Management actions for flora and vegetation have been revised to include additional survey and assessment outcomes and to target residual risks from the Project.<br><br>A further targeted survey for Hibiscus sp. Mulga Downs (S. Hitchcock SH 638) outside of the Development Envelope within potentially suitable habitat, was completed by Spectrum (Scott Hitchcock) in July 2025. While the final report will not be available until October 2025, the data from this survey has been provided. The survey identified a further 2,485 individuals. This brings the total number of known individuals to 4,226, of which the Proposal impacts 14.72% (down from 35.7%).<br><br>Item 3 of Table 3-4 of the WMP outlines management actions to mitigate impact on vegetation downstream of mine disturbance areas due to interrupted runoff regime. Section 4.3 of the WMP outlines vegetation health monitoring to be conducted in sheet flow vegetation areas.<br><br>HPPL acknowledge that complete avoidance of priority flora and locally significant vegetation communities is not possible. Environmental factors including Priority flora and vegetation of significance are considered through the iterative planning process.<br><br>The Development Envelope and Indicative Footprint has been revised and reduced through iterative mine planning to reduce the extent of clearing required where possible resulting in a 5,288.84 ha reduction in impacts to native vegetation. This includes a reduction in impacts to Priority flora. The original Project contemplated impacts to five Priority flora whereas the current Project contemplates impacts to three Priority flora.<br><br>As part of the detailed design for the Proposal, supporting infrastructure will be located to further minimise impacts to Priority species. Table 9-15 has been amended to include a commitment that final location of Proposal elements (i.e. linear / supporting infrastructure) will be designed to minimise impacts to Priority flora species.<br><br>The FHEZ is designed specifically around fauna habitat, however it still provides an exclusion zone to which clearing of vegetation will not occur. The FHEZ supports vegetation communities that may provide habitat for conservation significant flora species (for example, vegetation types TvHG, ASL(2) and THG(1) which occur within the FHEZ and FHEZ corridor are known to support *Triodia veniciae*, *Aristida jerichoensis var. subspinulifera* and *Dolichocarpa* sp. Hamersley Station (A.A. Mitchell PRP 1479), respectively).. |

## Terrestrial Fauna

| Item | Submitter | Submission and/or issue | Proponent Response |
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| 11 | NON-W8X1-NPA3-A | It is unclear what temporary disturbance is proposed within the FHEZ corridor. | The activities proposed and the nature of the impact within the FHEZ corridor are described within the ERD Section 2.2.3.10.<br><br>*The FHEZ Corridor will remain within the Development Envelope and will accommodate minor, low impact activities including an un-sealed light vehicle access road to support infrequent light vehicle access to a communications tower (which will be located approximately 200 m south of the FHEZ Corridor) and monitoring activities. An infrastructure corridor is also proposed within the FHEZ Corridor however this will only be developed if the related Mulga Downs Hub and Rail Spur Proposal (Assessment No. 2358) is approved. Disturbance within the FHEZ corridor will be limited to no more than 5 ha following approval of the Hub & Spur Proposal.*<br><br>The activities within the infrastructure corridor and the measures required to manage potential impacts will be assessed in a revised version of the CSFMP (prior to any activities being undertaken). |
| 12 | ANON-W8X1-NPA3-A | There are residual impacts to values of terrestrial fauna.<br><br>In particular, some short-range endemic (SRE) species have only been recorded within the development envelope. | Significant residual impacts to terrestrial fauna are outlined in Section 10.7 of the ERD. Offsets have been proposed for identified significant residual impacts, specifically, the loss of habitat.<br><br>One confirmed SRE species, *Buddelundia* 56, was recorded within the Development Envelope with a further 31 species being potential SREs. The one confirmed SRE species was found at three locations within Chenopod/Cracking Clay Floodplain and Drainage Line habitat. One of these locations occurs outside of the Development Envelope. Surveys for the SREs were completed across the greater landscape as required.<br><br>*Buddelundia* 56 was located within the Mulga West Borefield Area which is no longer part of this Proposal and will not be impacted with implementation of the Proposal . Refer to Biologic (2022a) Appendix 11b.1.<br><br>The habitats which supported these SREs within the Development Envelope are not fragmented and SRE records indicate dispersal from the eastern most section to past the Mulga West Borefield (no longer part of the Proposal). As the same habitat has been found to extend beyond the Development Envelope it is expected that the SREs are capable of dispersal. Many of the potential SRE specimens were found at multiple sites, demonstrating dispersal capability.<br><br>Section 10.3.5.2 has been amended to reflect the above and with Figure 10-21 updated to show the third confirmed location. |
| 13 | ANON-W8X1-NPA3-A | The management measures proposed for terrestrial fauna are insufficient.<br><br>The CSFMP is not clear on how weeds and feral fauna will be managed.<br><br>For example, the use of 'infestations' of feral fauna is not quantitative.<br><br>Five new species of aquatic fauna were recorded within the Freshwater Claypans of the Fortescue Valley PEC. However, no monitoring of the PEC or the aquatic fauna has been proposed.<br><br>No management provisions for SRE species have been included in the CSFMP. | The CSFMP has undergone a thorough revision to ensure it is adequate to manage impacts to conservation significant species and known habitat.<br><br>The objective-based provision for feral fauna management has been revised and re-presented as an outcome-based provision. This will allow the adaptive and appropriate management of feral fauna such that there will be no measurable increase in the predation of conservation significant fauna from the baseline.<br><br>The objective-based provision that manages environmental weeds has been revised to include commitments on adhering to operational weed management procedures as outlined in the ERD (Section 9.6.2.3).<br><br>Indirect impacts to species found in environments downstream of the Proposal will be managed through the WMP through the implementation of vegetation health monitoring and water sampling programmes. The details of these monitoring programmes are provided in the WMP. |

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| | | | The management of SRE habitat is directly managed through the limits on clearing of terrestrial fauna habitat and in some cases, through the limits on volume of removal of troglofauna habitat. As a result of this, there is no risk to SREs that needs further management through a standalone provision. |
| 14 | ANON-W8X1-NPA3-A | The proposed 50,000 mg/L limit of water used for dust suppression is excessive and stakeholders have not been adequately consulted on this limit. | This is an error (typo) within the ERD and HPPL would like to apologise for the confusion. HPPL is not currently seeking to use water for dust suppression above 5,000 mg/L TDS.<br><br>Tables 8-14, 9-15 and 18-1 of the ERD state:<br><br>Saline water (> 5,000 mg/L TDS) shall not be used for dust suppression unless approved by the Environmental Manager and where approved, dribble bars shall be used to control overspray onto adjacent vegetation<br><br>Section 9.6.2.2 of the ERD states: Saline water (> 5,000 mg/L TDS) will be limited to use in mine areas where vegetation has been cleared and therefore, the risk of vegetation health being impacted from use of saline water is low. |

## Inland Waters

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| 15 | ANON-W8X1-NPAG-X<br><br>ANON-W8X1-NPA4-B | Groundwater drawdown is likely to have significant impacts on ecological communities, the Fortescue River, and further reduce water levels at the Karijini National Park. | The figures and report sections referred to in this response are provided in Attachment 4 of Attachment 3 - Mulga Downs: Responses to EPA Comments .<br><br>As documented in the groundwater, surface water and ecohydrological baseline report (AQ2 2025a), no groundwater dependent vegetation has been identified in the study area (refer Executive Summary). Further, the low salinity of the ponded water within the claypans and the recorded depth to groundwater below the claypans indicates that the water is sourced from surface water runoff (refer Executive Summary of AQ2 (2025a)). Similarly, the depth to groundwater in the vicinity of the persistent pools, indicate they are surface water fed (refer Section 6.4 of the Baseline Report (AQ2 2025a)).<br><br>Comparing the observed water level recession in the claypans from recent rainfall events to evaporation data indicates that evaporation plays the primary role in removing collected water from the claypans, with only minor seepage to the groundwater system (refer Executive Summary of AQ2 (2025a)). The rate of seepage from the claypans is limited by the low permeability of the clay that lines the claypans.<br><br>As documented in the impact assessment report (Section 6 of AQ2 (2024)), the vegetation, and surface water features are not predicted to be impacted by groundwater level drawdown resulting from the proposed mining operations. The potential impacts of groundwater level drawdown to stygofauna are documented in Chapter 8 of the ERD.<br><br>Figure 5.16 in the Impact Assessment report (AQ2 2025a) presents the predicted maximum extent of groundwater for the life of mine, with the southernmost environmentally sensitive area (ESA) covering Karijini National Park. The predicted groundwater level changes have been plotted with respect to the closest gorges of the Karijini National Park in Figure 4.1 of Attachment 3 - Mulga Downs: Responses to EPA Comments (AQ2 2025b). These figures show that no measurable groundwater level reduction is predicted in the national park. |

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| 16 | ANON-W8X1-NPA3-A | The proponent has not conducted sufficient groundwater modelling, particularly on the expected impacts post-closure.<br><br>Long-term modelling of changes to salinity should be conducted to understand the risk to groundwater quality over time. Figures should also be provided to visualise the predicted changes. | The figures and report sections referred to in this response are provided in Attachment 5 of Attachment 3 - Mulga Downs: Responses to EPA Comments (AQ2 2025b).<br><br>As documented in Section 5.5.7 of Impact Assessment (AQ2 2024), HanRoy intend to backfill the pits to above the pre-mining groundwater level at the completion of mining. This eliminates any post-mining increases in groundwater salinity caused by evaporation from the pit lake surfaces. Although the modelling of post-mining groundwater quality has not been conducted, with no on-going dewatering and MAR, the pre-mining groundwater processes will re-establish. For example, fresh water from rainfall will recharge the system and the regional and pre-mining groundwater flow direction will return (the latter being indicated by closure model predictions). As such, any changes to the groundwater salinity distribution over the pit and MAR areas is anticipated to also return to pre-mining conditions. However, the return of the salinity distribution to pre-mining conditions will take considerably longer to achieve than the recovery of groundwater levels.<br><br>The groundwater impact assessment documentation (AQ2 2024) Section 5.5.6) provides further details regarding the predicted changes to groundwater salinity resulting from the proposed dewatering and MAR; salinity hydrographs and flow paths (Figures 5.18 and 5.19 respectively of the impact assessment report) were used to demonstrate the extent of the predicted groundwater salinity changes based on base case predictions. Additional salinity hydrographs for sensitivity predictions are also presented in Appendix F (Groundwater Model Predictions) of the groundwater impact assessment report.<br><br>Figure 2 has been prepared based on the previously reported information to better depict the modelled extent of groundwater salinity change. An area of potential groundwater salinity increase is presented in these figures, based on the following:<br><br>• Predicted salinity hydrographs, inclusive of sensitivity predictions.<br>• Predicted flow paths towards the modelled dewatering bores and away from the modelled MAR bores for the base case prediction.<br>• The predicted salinity of the reinjection water (predicted to range between 1,700 and 4,200 mg/L TDS) in comparison to the baseline salinity.<br><br>It is important to cross reference the area of predicted salinity increase with the baseline salinity distribution (refer Figure 3). For example, the area of freshwater defined by the 1,000 uS/cm EC contour is approximately 25% of the total area of salinity increase. The baseline groundwater salinity naturally increases towards the centre of the valley (i.e., south of the MAR bores), therefore the magnitude of salinity increase resulting from reinjection diminishes with increasing proximity to the valley.<br><br>Figure 4 shows no predicted increase in groundwater salinity in the vicinity of Youngaleena and Wirrilimarra.<br><br>Based on the modelling to date (inclusive of uncertainties) increases in groundwater salinity are anticipated to extend up to ~3.6 km from the modelled dewatering and MAR borefields.<br><br>As such, HPPL does not currently intend to model the long-term changes and recovery of water quality post-mining. |
| 17 | ANON-W8X1-NPA3-A | Sufficient baseline studies have not been undertaken to understand the surface water quality within and near the development envelope. | Baseline monitoring is an ongoing planned activity to support mitigation of impacts. Where appropriate the WMP will be updated to reflect the new data and baseline characterisation.<br><br>Surface water samples have been collected from monitoring sites since 2019. Surface water samples have been collected either from passive sampling units (within drainage lines) or directly from the claypan (or other ponded areas of water). Passive sampling units are positioned to be above the base of the channel so that they do not collect runoff during the “first flush” or from small events.<br><br>The baseline assessment report (AQ2 2025, PER Appendix 7) presents collected water quality between 2018 and November 2023. During that period of time:<br><br>• 5 monitoring rounds were completed.<br>• 25 water quality samples were collected and analysed from the 5 designated sampling locations plus from ad-hoc sampling locations. |

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| | | | • Sample collection was impacted by timing, location and intensity of rainfall, access to sampling areas (due to flooding, permissions) and integrity of monitoring stations following large runoff events.<br>• The pressure transducers installed in the creeks and the claypans provide salinity time-series data coverage at 30-minute increments for a large portion of the baseline monitoring period.<br><br>Note that the two sampling locations where only 1 sample was collected, were locations where ad-hoc/opportunistic water quality samples were collected (SWML09 and SWML13), with the sampling locations proposed to be included in the monitoring network going forward (subject to approval).<br><br>Further, note that the runoff which collects in the claypans evapo-concentrates such that the concentration of parameters in the claypans will increase as the ponded water evaporates.<br><br>Table 3.4 in the WMP (HPPL 2025, ERD Appendix 6) commits to continuing to collect baseline surface water quality data through to the commencement of construction, operation and post-mining (for a 2 year period). During operation of the mine, monitoring stations have been proposed which will provide reference surface water quality outside of the areas where surface water would be impacted by mining activities.<br><br>In addition to the data reporting in the baseline assessment report, additional surface water monitoring locations were installed in 2023 (but not sampled within the baseline assessment reporting period), and further locations are proposed but require approval to be installed. As part of the on-going baseline data collection, the following additional surface water samples have been collected:<br><br>• 2 sampling rounds in 2024, resulting in 10 samples in total.<br>• sampling round to date in 2025, resulting in 3 surface water samples.<br><br>When the full surface water sampling locations are installed, there will be a total of 16 sampling locations within the network. These were shown in Figure ***1*** (attachment to responses) from the baseline assessment report (AQ2 2025, ERD Appendix 4). Note that the alignment of the sampling transects within the claypans may be adjusted slightly to align with access, but there remains two proposed sampling transects in each claypan. |
| 18 | ANON-W8X1-NPA4-B<br><br>ANON-W8X1-NPA3-A | There are residual impacts to groundwater that have not appropriately been addressed.<br><br>The residual impacts associated with disposal of excess water via groundwater reinjection and pit infiltration has not been adequately considered. | HPPL have prepared a WMP for the Project in accordance with the EPA technical guidance (EPA, 2021) The Outcome based provisions for the plan are:<br><br>• Protection of regional aquifer for groundwater users (pastoral, communities and stygofauna).<br>  ○ No measurable change, attributable to the Proposal, to groundwater level at Youngaleena and Wirrilimarra community bores for the life of the Proposal.<br>  ○ No measurable change, attributable to the Proposal, to groundwater quality at Youngaleena and Wirrilimarra community bores for the life of the Proposal.<br>  ○ No exceedance of the drinking water guidelines for beef cattle tolerance limit of 5,000 mg/L TDS for the life of the Proposal for groundwater sourced from pastoral groundwater bores within the Salinity Impact Area.<br>  ○ Groundwater quality is managed such that there is no increase in salinity above 7,810 µS/cm (EC) (equivalent of 5,000 mg/L (TDS)) or the pre-disturbance baseline level, whichever is higher, within the Salinity Impact Area for the life of the Proposal and post-closure. Limit to the extent and magnitude of groundwater mounding from MAR.<br>• No indirect impact to vegetation health and terrestrial fauna habitat from groundwater mounding from the Project.<br>• No release of WRD leachate or contaminants from mining to groundwater and/or surface water |

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| | | | • Limits on removal of likely stygofauna and troglofaunal habitat from mining.<br><br>Objective based management targets for the plan are:<br><br>• No degradation of surface water quality reporting to downstream environments due to mining and associated activities. No. 1<br><br>• No significant modification to the hydrological function of the claypans and other ponding areas in the Fortescue Valley due to mining activities. In particular, the hydroperiod of the claypans should not be significantly impacted. No. 2<br><br>• Minimal impact on vegetation and fauna habitat quality immediately downstream of mine disturbance areas due to interrupted runoff regime and altered sediment transport. No. 3<br><br>As outlined in section 7.8 of the ERD, the residual impacts of the Proposal to Inland Waters are not considered significant. HPPL therefore considers the Proposal can be managed to meet the EPA's objective to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.<br><br>In-pit infiltration does not form the base case surplus water disposal method at this time and will be subject to further evaluation and trials when the Project is in development and operation. |
| 19 | ANON-W8X1-NPA3-A | Insufficient management measures have been proposed for impacts to surface water quality.<br><br>Further management measures should be provided to ensure leaks of saline water from pipes are contained.<br><br>Further detail should be provided on the post-closure management of surface water diversion structures. | As an outcome of the response to submissions, HPPL have undertaken a review of the WMP including updates to the provisions for management of contamination of surface water and monitoring proposed.<br><br>HPPL remains committed to managing the risk of saline water leaks through appropriate engineering controls. All saline pipelines will be either bunded or equipped with telemetry and/or pressure sensors to enable rapid detection and response to any leaks or failures.<br><br>The original commitment to bunding all saline pipelines was made when Managed Aquifer Recharge (MAR) activities were proposed within the Mungurrdu area, which holds ethnographic significance for the Banjima People. Since then, the Proposed Action has been amended to relocate MAR activities outside of Mungurrdu and significantly reduce the volume of saline water involved. As a result, the risk of surface water contamination has been materially reduced.<br><br>Given these changes, the revised approach utilizing telemetry, pressure sensors, bunding, or a combination thereof is considered proportionate and effective in managing residual risk. HPPL remains open to further engagement to ensure these measures are clearly understood and appropriately implemented.<br><br>During operations, Surface water flows along the drainage/creek lines will be diverted as a result of mine pits, waste rock dumps, borrow pits, airport, haul and access roads, pipelines, and other infrastructure associated with the Proposal. These diversions will be constructed to a design appropriate for the life of the operations.<br><br>Upon cessation of operations, non-permanent diversion structures will be removed, and the surface will be re-shaped to blend into adjacent ground levels, reinstating natural drainage lines where feasible. Some permanent diversion and water management structures may remain post closure. Such permanent structures will be designed with consideration of an agreed future rainfall intensity scenario and final landform features, at least 5 years prior to the end of mine. |
| 20 | ANON-W8X1-NPA3-A | Insufficient management measures have been proposed for impacts to groundwater, including potential impacts post-closure.<br><br>The WMP states that groundwater trigger and threshold criteria will be developed on a case-by-case basis, which appears to only consider pastoral use and does not provide sufficient protection for environment values. | HPPL have included provisions for monitoring impacts to groundwater, surface water and vegetation health (and fauna habitat) post-mining within the updated WMP.<br><br>The WMP has been updated to reflect a more comprehensive approach. The reference to a case-by-case basis in Table 3-1 (Outcomes-Based Management of Groundwater Levels and Quality) applies specifically to groundwater users. |

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| | | It is unclear what the chosen trigger criteria chosen for groundwater salinity (4,500 mg/L) was based on, as most stygofauna species are unable to tolerate this level of salinity.<br><br>The assumption that the rooting depth of vegetation will not extend beyond 2.5 mbgl is not substantiated and requires further evidence if it is to be used as the threshold criteria for groundwater mounding.<br><br>The assumption that a continuous calcrete layer will confine reinjected saline water does not have sufficient contingencies if reinjected groundwater is observed to be mixing with the upper fresh water layer.<br><br>The wording in the commitment to backfilling pits to above the water table is unclear and should be clarified to ensure no pit lakes are present after closure. | Table 2-1 has been revised to include subterranean fauna within the rationale for environmental indicators, highlighting their importance as a receptor.<br><br>HPPL's overall rationale and approach are outlined in Section 1.4 of the WMP. This includes planned updates to the WMP prior to construction and again following the commencement of dewatering. Table 1-12 outlines the key assumptions that underpin this approach.<br><br>The WMP includes provisions for adaptive management and review (see Section 7), which involves applying knowledge gained through monitoring and studies to refine management actions over time. In line with HPPL's Environmental Management System (EMS) framework (Figure 2-1), the WMP will be revised based on outcomes from relevant studies—including monitoring for groundwater and surface water, vegetation health, and subterranean fauna.<br><br>These studies will provide critical data to inform and address the ecological requirements of both vegetation (and associated fauna) and subterranean fauna, ensuring ongoing alignment with environmental objectives.<br><br>The WMP recognises pastoral bores as groundwater users and references the stock watering guidelines for beef cattle, which set a tolerance limit of 5,000 mg/L TDS (ANZECC/ARMCANZ, 2000; ANZG, 2018).<br><br>The WMP has been updated to include Subterranean Fauna as a key environmental receptor. Following early work on the relationship between salinity tolerance by Bennelongia (2024) and a subsequent peer review of this work (Biologic 2025), the salinity tolerance of stygofauna species has been statistically assessed by JBS&G (2025). The outcomes of this assessment have been discussed previously in response to EPAS submission 19 and 23. This work informs the revised trigger and threshold criteria and environmental outcomes presented in the WMP.<br><br>Table 2-3 of the WMP presents provisional groundwater quality trigger values, as applied by CBEC (2024), to guide the management of potential water quality impacts.<br><br>The monitoring which will be undertaken in the WMP provides the salinity data at selected locations to ensure the quality of the subterranean fauna habitat outside the area of impact is maintained to ensure biological diversity and ecological integrity is maintained for the stygofauna.<br><br>The root depth of <2.5 m is not only based on the Upper Calcrete and / or low permeability clay units impeding root depths. It is also associated with:<br><br>• Typical characteristics of Acacia species. Trench work by AQ2 in similar geomorphological settings in the Fortescue Marsh valley shows mulga roots depths are generally less than 2.5 m (unpublished reports).<br><br>• The lack of identified groundwater dependent vegetation (i.e., root depths must be limited to the zone above the water table).<br><br>Regarding the latter, this has been evaluated using seven of the assessment tools outlined in the Australian groundwater-dependent ecosystems toolbox (Richardson et al. 2011), refer Section 9.1 of the baseline assessment report (AQ2 2025).<br><br>As summarised in the Executive Summary and Section 10.14 of the baseline assessment report (AQ2 2025), it is concluded that groundwater dependent vegetation does not occur in the Study Area, based on the following supporting evidence:<br><br>• Groundwater underlying the Fortescue Valley environs is generally brackish/saline and therefore does not constitute a favourable water source for floodplain vegetation.<br><br>• Regolith characteristics in the Fortescue Valley environs suggest that vegetation rooting depth is impeded by massive calcrete or dense, low permeability clay layers. Owing to access and ground disturbance constraints due to heritage values in these areas, direct observation of tree roots were limited to several sump pits associated with hydrogeological drilling.<br><br>• Across the Study Area, there are no areas of persistently high greenness as measured by time series NDVI imagery. |

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| | | | • Time series pre-dawn leaf water potentials indicate the tree-root zones are in unsaturated media with widely varying soil matric pressure, that is generally lower (i.e. more negative) than -0.5 MPa. Also taking into consideration the potential influence of brackish groundwater, this precludes the roots being in groundwater or at the capillary fringe.<br><br>• Based on water balance modelling supported by on-ground vegetation measurements (i.e. woodland tree size and density), surface water inputs were calculated to be sufficient to support the density of trees occurring in the Fortescue Valley E. victrix woodland communities. The more dense woodland stands are associated with better structured soils with relatively higher plant-available water storage capacity.<br><br>With regards to the impeding nature of the Upper Calcrete with respect to root depth, this has been observed in ~1.5 km of exposed soil sections (in drilling sumps in the valley area); refer Section 9.3.3 of the baseline assessment report (AQ2 2025). Additionally, the continuous extent of the Upper Calcrete has been confirmed by all hydrogeological and mineral exploration drilling across the valley area.<br><br>Along the northern flank of the valley, where the Upper Calcrete thins / wedges out, it is proposed that root depth trenching investigations will be undertaken; particularly as this has been identified as an area where there is an increased risk of groundwater mounding, resulting from MAR (i.e., along the break of slope, immediately south of MAR areas) (refer Figure 6.1 below). Although the trenching locations are yet to be determined, it is proposed that root depth investigations will be undertaken in the two main ecohydrological units of these break of slope / valley areas (i.e., the Loamy Flats and Stony Flats EHUs).<br><br>While the weight of current evidence supports the conclusion with regards to root depths, comprehensive water and vegetation health management plans will be implemented to manage potential residual risk.<br><br>Details regarding backfilling of pits and WRD height are included within the ERD Section 2.2.3.9 Rehabilitation and Appendix 03 Preliminary Mine Closure Plan.<br><br>Open Pits - HPPL will back fill the pit voids to ensure backfill is above the water table after settlement (+2m to account for settlement), and as such pit lakes after closure will be avoided.<br><br>This will be further informed by future infield study work as part of the closure planning and engagement process. |
| 21 | ANON-W8X1-NPA4-B | Concern that the pools within the Fortescue River will be used for recreational use. | The Claypans and Channel Pools are outside of the Development. HPPL are not proposing to monitor/manage access to these areas by the Public or Traditional Owners for cultural/recreational purposes.<br><br>In relation to the Project, HPPL are proposing to access to the Clay Pans and Channel pools via existing tracks currently used for pastoral purpose. Activities will be limited to the monitoring proposed within the WMP (provisions to manage potential hydrological/hydrogeological impacts attributable to the Project).<br><br>Access to the Claypans and Channel Pools by HPPL personnel for non-routine activities (i.e. activities other than environmental monitoring) will require a Non-Ground Disturbance Permit (NGDP). The NGDP process ensures that the correct land access protocols have been followed i.e. prior notification of relevant land holders and stakeholders. Failure to adhere to the NGDP process will constitute a non-compliance will HPPL process and be treated as an event that requires investigation with outcomes and corrective actions.<br><br>Recreational use of the pools within the Fortescue River will not be authorised by HPPL. |

## Subterranean Fauna

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| 22 | ANON-W8X1-NPA3-A | The surveys conducted for subterranean fauna are insufficient, and further sampling should be conducted.<br><br>The subterranean fauna reports do not align with EPA guidance (2021), as is it unclear as to whether adequate data has been collected to meet the EPA objective for subterranean fauna. Further, the reports do not clearly describe the potential residual impacts associated with the proposal or conclude whether additional surveys should be conducted.<br><br>Sufficient subterranean fauna surveys have not been conducted outside the proposed impact areas of groundwater drawdown and mounding.<br><br>The reference sites for subterranean fauna surveys are inadequate. | The surveys undertaken for subterranean fauna are considered adequate and meet the EPA Technical Guidance – *Subterranean Fauna Surveys for Environmental Impact Assessment, Environmental Protect Authority, 2021*<br><br>Each survey undertaken was tailored to its specific objective, informed by the outcomes of previous surveys, and developed in context—such as addressing gaps in knowledge (e.g. functional group data), identifying singletons, and determining the extent of occurrence. "Context" in this case refers to the strategic selection of sampling sites both within and beyond the area of potential impact, based on habitat extent and ecological relevance. Current best practice in subterranean fauna surveys no longer relies on a fixed number of reference sites. Instead, emphasis is placed on collecting data that allows for risk assessment and informs appropriate mitigation measures. The extent of the survey, as shown in Figures 8.1 and 8.2 of the ERD, is considered appropriate for impact assessment). Figure 8.1 and Figure 8.2 have now been updated with an additional 66 sites sampled for troglofauna during the 2025 targeted troglofauna survey. These sites are shown in the context of the six potentially restricted troglofauna which were identified in the ERD Rev 4 as Attachment 1 – Figures, Figure 5.<br><br>Note – the reassessment of the risk to troglofauna found only two were now potentially restricted because of their known limited dispersal abilities for this genus. The 2025 sampling program has been undertaken by Biologic following a review of areas which required more information to inform the SRE troglofauna located within the proposed mine pit EPA Technical Guidance – *Subterranean Fauna Surveys for Environmental Impact Assessment, Environmental Protect Authority, 2021*. This targeted troglofauna survey will provide additional information on the dispersal of the troglofauna in these geologies.<br><br>The ERD includes a detailed discussion on habitat extent, sampling effort, and the targeted investigation of knowledge gaps related to the extent of occurrence of potential SREs. Importantly, the scale of impact differs between stygofauna and troglofauna due to their differing dispersal capabilities, and the survey design reflects these biological characteristics.<br><br>As noted in the EPA Technical Guidance – *Subterranean Fauna Surveys for Environmental Impact Assessment, Environmental Protect Authority, 2021* reference sites for troglofauna may not always align spatially with impact areas, due to their limited dispersal and patchy distribution. As such, the troglofauna survey strategy included sampling in areas outside the direct impact zone, where suitable habitat is expected to persist. This approach is illustrated in Figure 8.3 of the ERD and provided below (Attachment 1 – Figures, Figure 5).<br><br>The overall survey effort for the Proposal has been extensive, systematic, and fit-for-purpose, with a clear focus on identifying and assessing risks to subterranean fauna. This includes the review and interpretation of collected data, and comparison with established datasets through genetic barcoding and data-sharing arrangements. |
| 23 | ANON-W8X1-NPA3-A | Potential residual impacts to subterranean fauna have not been adequately addressed.<br><br>The proponent has not adequately addressed the potential impacts from groundwater reinjection, including loss of habitat from groundwater mounding, death due to the speed of reinjection outpacing the speed of dispersal, and a reduction in soil habitat quality post-closure from residual salt after groundwater subsides.<br><br>The proposal is likely to have significant residual impacts to values of subterranean fauna, and offsets should be considered if impacts cannot be further avoided or minimised. | Impacts to subterranean fauna have been addressed in detail within the ERD (and now updated based on additional work undertaken since the Public Review period). Residual impacts to stygofauna habitat are presented in the context of remaining suitable habitat, which was defined using 3D habitat modelling. This approach allowed for the identification and assessment of residual impacts alongside the distribution and extent of remaining habitat. This is presented in Section 8.6.2.<br><br>Loss of habitat from groundwater mounding is discussed in the ERD in section 8.4.1.1. The loss of habitat was calculated based on lateral habitats (aquifers) and vertical in terms of changes in salinity in the groundwater |

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| | | | profile. The block model of the inferred baseline salinity ranges at depth indicates that there are no barriers to dispersal.<br><br>The impacts to stygofauna from the reinjection of mine dewater was considered and is further addressed in the updated ERD (Section 8.6.3.2). It is expected that stygofauna are able to disperse across the unconfined aquifer. The area of predicted change of salinity is now presented in all figures. The speed of the reinjection and movement of stygofauna has not been calculated. Surveys have found that they do occur across the landscape and following the direction of the groundwater. Many are in drainage lines which is consistent for stygofauna in the Pilbara.<br><br>Outcome based provisions for groundwater level (mounding and drawdown) and quality/salinity change from MAR and potential leachate/contamination from mining are included in the WMP. The statistical analyses have been used to establish the relationship between key stygofauna and salinity. The output informs the development of trigger and threshold values for stygofauna. No stygofauna were considered to be restricted – however these values were developed to ensure stygal groups are protected. These are presented in the memo in Appendix 33 (JBS&G 2025, *in prep.*).<br><br>At the conclusion of operations, all activities that influence groundwater, such as pit dewatering and managed aquifer recharge, will cease. Mine pits will be progressively backfilled to levels above the pre-mining groundwater table to support natural hydrological recovery.<br><br>The local aquifer is unconfined and primarily recharged through rainfall infiltration. Based on hydrogeological assessments, it is expected that groundwater levels and quality will gradually return to pre-mining conditions over time. While long-term impacts on subterranean fauna are considered unlikely due to the aquifer's natural resilience, HPPL remains committed to ongoing monitoring and adaptive management to ensure post-closure recovery is achieved and sustained. |
| 24 | ANON-W8X1-NPA3-A | The information provided in section 8 of the ERD is unclear should be clarified.<br><br>Section 8.3.2.2 of the ERD states that targeted subterranean fauna sampling was undertaken over three consecutive months; however, this is misleading as it was not specified that consecutive sampling was only done for stygofauna.<br><br>It is not clear if the proponent is engaging in subterranean fauna data-sharing, such as through the Western Australian Biodiversity Science Institute's subterranean fauna program.<br><br>Table 8-10 of the ERD states that over 99% of upper calcrete/calcrete habitat will remain, however, this does not appear to be consistent with Table 8-9 of the ERD (and table 4.1 of Appendix 9).<br><br>Table 8-15 of the ERD states that stygofauna will not be impacted from changes to groundwater level, however, groundwater drawdown will impact stygofauna.<br><br>The submitter considers that text in section 8.4.1.2 of the ERD does not appropriately match the chosen reference (EPA 2012), as EPA (2012) does not draw the conclusions that troglofauna "live in working pits" or "recolonise areas where mining has ceased."<br><br>Section 8.6.3.2 of the ERD states that changes to groundwater quality is expected to be localised, "<2 km in extent." It is not clear what this 2 km extent is in relation to, e.g., 2 km beyond the development envelope or 2 km from each reinjection bore. | Section 8 of the ERD (Subterranean Fauna) has been reviewed and updated in response to public submission.<br><br>Targeted surveys included deployment of traps and scraping of sample holes. This is stated in Table 8-4 sampling effort. Traps are deployed for 8 weeks. Traps were collected in January 2024 (after remaining for 8 weeks as per EPA guidelines). This is stated in Table 8-4 of the ERD. Holes which were targeted for troglofauna were scraped prior to the trap placement. Details of the methodology are provided in the supporting report and align with EPA guidelines. The methods employed were also provided in Section 8.3.2.2.<br><br>GenBank allows for comparison of data publicly and is considered by the majority of consultants in this field as the most reliable for the storing of information. It is also an available source for accurate data sharing. Publications by WABSI have credited Hancock Prospecting and Roy Hill for contributing information. These two companies make up HanRoy. The SEAF portal is not yet functional (as is understood) and will rely on the accuracy of the data provided. HPPL, through their data peer review, will be uploading the molecular data into GenBank and providing the results in an updated IBSA package. SEAF incorporates the use of IBSA.<br><br>Table 8-9 provides the proportion of habitat loss within the areas of Impact (excavation and mounding. Table 8-9 is referring to the impact (loss) of the total extent of available habitat known to occur (i.e. both inside and outside the area of impact).<br><br>As outlined in Section 8.6.3.3 of the ERD a number of stygofauna were listed as having limited ranges or restricted (by Bennelongia 2024) to areas of impact. These areas of impact were identified as a predicted groundwater drawdown of ≥2 m and the area of predicted salinity changes. These "restricted" stygofauna were |

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| | | | assessed based on a number of criteria in the risk ranking rationale stated in Section 8.3.2.8 and presented in Table 8-7 and Table 8-13. These stygofauna were collected in geological units which are contiguous and extend beyond the area of impact. An assessment of the risk to these taxa was undertaken based on taxonomic factors and distribution within the identified likely habitats. Assessment based on their area of occurrence (being the likely habitat) as a factor found that no stygofauna collected, to date, were considered at risk from the effects of mining or drawdown.<br><br>In response to concerns with regard to misdrawn conclusions, HPPL has reviewed the text provided in the ERD with reference to EPA (2012).To summarise, troglofauna were found at Mesa A, they were present during mining operations and were also found after mining ceased. This was summarised in EPA (2012) however the work was presented by Biota at a subterranean symposium. Section 4.3.1 in EPA (2012) states: The observed persistence of subterranean fauna during and after mining operations indicates that species are often likely to have distributions larger than the small areas from which they have been recorded. The post-mining sampling undertaken at Mesa K in the Pilbara demonstrated that subterranean fauna was present despite previous mining activities. The results from Mesa A also show that subterranean fauna persists in areas which are subject to disturbance from mining. Monitoring of subterranean fauna populations at Cape Range have also shown persistence of species recorded prior to mining. Additional species were recorded over time than were recorded in initial surveys.<br><br>The change is water quality is primarily through changes in groundwater salinity from reinjection of mine dewater. This extent is now provided as a polygon and referred to as the extent of predicted groundwater salinity changes. This is presented in all relevant figures. |
| 25 | ANON-W8X1-NPA3-A | The ERD does not appear consistent with the conclusions drawn in technical reports.<br><br>Table 8-13 does not appear consistent with the conclusions drawn in Appendix 22 regarding the salinity tolerances of stygofauna species. For example, Appendix 22 of the ERD states that 80% of Pilbara stygofauna have a mean salinity tolerance of less than 1,800 mg/L.<br><br>The text in section 8.4.1.2 regarding connectivity of troglofauna habitat and dispersal of species does not align with the conclusions reached in Appendix 26 of the ERD, as Appendix 26 states that species recorded in banded iron formation and calcrete are likely to have small ranges.<br><br>Further, Appendix 26 states that not all troglofauna groups utilise undifferentiated sediments and that clay has infilled a lot of the available pores in this geological unit.<br><br>Section 8.7 of the ERD states that no stygofauna taxa will be lost, which is not supported as there is significant risk from dewatering and changes to groundwater quality. Further, the conclusion that there is no evidence of isolated or fragmented habitat is misleading as this may be due to insufficient sampling. | There is some variance between the conclusions drawn in supporting documents and the ERD impact assessment. The conclusions drawn in the supporting documents are based on interpretations on available information and this is not inconsistent with other environmental impact assessments.<br><br>***Salinity tolerances (memo 675 – salinity tolerances; Appendix 22)***<br><br>As stated in memo 675 (Appendix 22), salinity data on stygofauna in the Pilbara is limited. As such, the salinity tolerances presented in Appendix 22 only represents data from very limited sources. This salinity memo was peer reviewed at the request of EPA and presented in the Biologic (2025) *Peer review of Salinity tolerance of stygofauna at Mulga Downs Iron Ore Mine. Memo 675)* (Appendix 31).<br><br>Addressing the recommendations in the Biologic (2025) peer review (Appendix 32) the salinity tolerances of the stygofauna, presented as the SRE OTUs and also as “functional” groups, were investigated using statistical analyses. These analyses investigated the relationship between the selected stygofauna (SREs and as functional groups such as the Orders or their genera where available) and salinity using the block model of inferred baseline groundwater salinity values up to 30 mbgl. The distribution of the stygofauna against salinity showed a greater salinity range (or tolerance) for the majority of the OTUs. This work is presented in JBS&G (2025) *Analysis of stygofaunal associations with groundwater salinity and potential salinity tolerances based on observations, for the MDIOM* (Appendix 33 [in prep]). An example of the salinity ranges of two stygal groups the *Areacandona* and *Billibathynella* are presented in Figures 8.20 and 8.21 (respectively). The ranges can be seen to exceed those presented in Appendix 22.<br><br>Further investigation found that troglofauna have been yielded in undifferentiated sediments – this includes the recent targeted 2025 survey. An explanation for this will be addressed in the outcomes of this work. The limitations to defining the presence of subterranean fauna are discussed in Bennelongia (2024) - *Mulga Downs* |

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| | | | *Iron Ore Mine: Subterranean Fauna Survey 2019-2024. Report 595*. (Appendix 26) and acknowledges that there may be some exceptions.<br><br>There are several inferences in Appendix 26 which lack supporting information. The report has since been peer reviewed and the information following this peer review, including a reconciled dataset with consistent naming has been applied to the ERD and the impact assessment undertaken.<br><br>The impact assessment on the stygofauna was based on the updated dataset and the rationale that dispersal is possible from areas of impact to areas outside any impact from the Proposal.<br><br>The 3D habitat assessment completed for the stygofauna (Appendix 9) identified that the aquifers known as suitable stygofauna habitat are contiguous and extend beyond areas of impact. As stated above, biological connectivity has been shown across the landscape within these aquifers. It is expected that the stygofauna occupy the groundwater to 30 mbgl. This is supported in EPA 2021 - *Technical Guidance – Subterranean Fauna Surveys for Environmental Impact Assessment.* As such, no barriers have been found laterally and vertically that would present the stygofauna from dispersal. OTUs such as the *Pilbaranella* (Syncarids) are shown to have lower tolerances. The *Pilbaranella* collected and presented in this assessment were collected in 2014 and no water quality was provided. However, these OTUs appear to only occupy the habitats which will remain less saline. These OTUs were collected primarily from drainage lines, where Syncarids are usually collected, and at very shallow depths (30 cm bgl). This has been discussed in memo 675 (Appendix 22).<br><br>Vertical fragmentation (as a result of potential haloclines) were also investigated using groundwater data and the block model for inferred baseline salinity ranges at depth. No haloclines were found up to 30 mbgl. This was also discussed in memo 675 (Appendix 22).<br><br>It has been acknowledged in the ERD that many of the SREs linear distances (that is their distribution) may be an artifact of sampling (which is acknowledged by the EPA) and the result of poor resolution which for some OTUs could not be reconciled. The EPA acknowledges this limitation, and the use of habitat connectivity is an accepted method of assessing potential risks to subterranean SREs and mitigating the impacts.<br><br>The sampling program for the MDIOM is extensive and has been undertaken across the landscape. The high number of taxa / OTUs is because of the high sampling effort. Surveys aligned with the EPA 2021 - *Technical Guidance – Subterranean Fauna Surveys for Environmental Impact Assessment.* As stated above, singletons are often the product of the type of sampling for stygofauna, the state of knowledge of this group and the cryptic nature of the taxa. This is addressed in all technical reports for this group, supporting literature and in detail in EPA (2012) - *A review of subterranean fauna assessment in Western Australia. Discussion Paper*. This discussion paper resulted in much of the present work on sampling efficacy for subterranean fauna being undertaken by WABSI and led to the revised guidelines (EPA 2021) which now considers habitat and connectivity. |
| 26 | ANON-W8X1-NPA3-A | Sufficient monitoring and management measures have not been proposed for subterranean fauna, particularly for subterranean fauna with potentially restricted distributions.<br><br>The WMP and SFMMP do not adequately address the risks from changes to groundwater salinity. For example, the water quality triggers and thresholds in the WMP do not appear to be based on the salinity tolerances of stygofauna.<br><br>Sufficient consideration has not been given to minimising the potential impacts on subterranean fauna from spills and leaching of contaminants. | The WMP now includes Subterranean Fauna as a key environmental receptor. Salinity trigger and thresholds have been established and are presented in the WMP in Table 2-1.<br><br>The potential impacts from groundwater salinity changes to stygofauna have been further addressed in the updated ERD (Section 8.4.3). Additional studies include the use of statistical analyses identifying the distribution of stygofauna and salinity (JBS&G 2025; Appendix 33). This is further discussed in Section 8.4.3.2. The statistical analyses have been used to establish the relationship between key stygofauna and salinity. No stygofauna were considered to be restricted – however these values were developed to ensure stygal groups are protected. These are presented in the memo in Appendix 33 (JBS&G 2025, *in prep*). |

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| | | Table 2.1 of the SFMMP does not describe the monitoring provisions in sufficient detail. It is not clear how compliance against trigger and threshold criteria will be monitored, and who will be responsible for monitoring.<br><br>The trigger and threshold exceedance responses in Table 1.9 of the SFMMP are insufficient to mitigate impacts to subterranean fauna. For example, setting a threshold value of lithologies at 100% of the defined ore resource does not provide sufficient mitigation for species only found within the pit footprint areas.<br><br>The submitter considers that proposed monitoring is limited to groundwater level, salinity, and habitat volumes, and should be expanded to include ecological indicators such as community structure or population trends.<br><br>The submitter considers that the response action for providing awareness training after a threshold criteria has been breached is not appropriate.<br><br>The commitment in section 2.2.2 of the SFMMP to undertake targeted surveys for restricted troglofauna prior to mining does not adequately protect troglofauna, as the results of the survey do not restrict from commencing mining. Further management, such as exclusion zones, should be proposed until the restricted species proposed to be impacted can be found outside the impact areas.<br><br>The SFMMP does not define what ‘`effective’ recolonisation of backfill pits is, nor ‘acceptable’ salinity levels.<br><br>It is not clear why the WMP is referenced in Table 2-3 of the SFMMP. | The WMP now provides monitoring provisions for the stygofauna. If the groundwater salinity thresholds are exceeded, then sampling for stygofauna will be undertaken. This is provided in Section 3.4 of the WMP.<br><br>Table 2-4 address habitat loss and thresholds for troglofauna. This table has been updated.<br><br>Population trends for cryptic species is not a measurable indictor in any ecosystem. Community structure is considered for future sampling should thresholds exceed. The focus for EIA is on species and this is presented in the EIA.<br><br>The SFMMP has been replaced with the WMP. The troglofauna community at MDIOM has been well characterised to allow for EIA and therefore the commitment in Section 2.2.2 of the former SFMMP is no longer required. Since submission of the draft SFMMP additional work on the troglofauna was completed. This includes a targeted troglofauna survey to further characterise / understand area where there is a higher probability of SREs to occur.<br><br>Recolonisation of backfilled pits is no longer considered as option. Instead, the areas proximal to the pits have been retained as habitat.<br><br>The WMP includes the subterranean fauna as a key environmental factor and replaces the SFMMP as requested by the EPA. |
| 27 | ANON-W8X1-NPA3-A | The SFMMP does not adequately consider the long-term impacts on subterranean fauna, including the potential additional impacts of climate variability.<br><br>The submitter considers that the five-yearly review cycle of the SFMMP should be reduced to two years, and that more clarity should be given on how stakeholder consultation will occur.<br><br>The adaptive management measures contained in the SFMMP do not include sufficient detail on how and when trigger and threshold criteria will be revised.<br><br>No detail or evidence has been provided to ensure that subterranean fauna habitat recovers post-closure. This includes species that are likely to be impacted by increases to groundwater salinity. Contingency measures should be provided beyond general monitoring and reporting. | The impacts of climate variability on subterranean fauna is reliant on the response of the groundwater to recharge. The impact assessment has considered the residual impacts on subterranean fauna during the LoM.<br><br>The WMP, which now includes provisions relevant to the subterranean fauna, will be reviewed on a biannual basis. This will incorporate adaptive management procedures and revised modelling of impacts to ensure triggers and thresholds remain relevant to protect subterranean fauna.<br><br>The WMP provides triggers and thresholds for groundwater quality. These will be measured throughout the LoM and manage impacts to stygofauna habitat.<br><br>At the conclusion of mining operations, all activities that influence groundwater, such as pit dewatering and managed aquifer recharge, will cease. Mine pits will be progressively backfilled to levels above the pre-mining groundwater table to support natural hydrological recovery.<br><br>The local aquifer is unconfined and primarily recharged through rainfall infiltration. Based on hydrogeological assessments, it is expected that groundwater levels and quality will gradually return to pre-mining conditions over time. While long-term impacts on subterranean fauna are considered unlikely due to the aquifer’s natural resilience, HPPL remains committed to ongoing monitoring and adaptive management to ensure post-closure recovery is achieved and sustained. |
| 28 | ANON-W8X1-NPA3-A | Section 8.3.2.8 of the ERD states that subterranean fauna data is being peer reviewed. The report of this peer review should be provided to assist with the assessment of impacts to subterranean fauna. | The peer review is complete, the updated dataset has been applied to the ERD Rev 5. The peer review report is provided in Appendix 31. This report is referred to as Biologic (2025) *Peer Review of the Subterranean Fauna Survey Report 2019-2024 (Bennelongia 2024 report 595)*) |

| Item | Submitter | Submission and/or issue | Proponent Response |
|---|---|---|---|
| 29 | ANON-W8X1-NPA3-A | The submitter considers that there is significant biodiversity of subterranean fauna in and around the proposal, and a higher biodiversity than other regions in WA that are determined to be Threatened ecological Communities (TEC) or Priority Ecological Communities (PEC). Appendix 26 of the ERD describes that the proposal has recorded substantial subterranean fauna communities, and that the stygofauna community would be considered globally significant. The submitter considers that the subterranean fauna community should be nominated to DBCA for consideration as a TEC or PEC. | Noted. Nominations for TEC or PEC listings are managed by DBCA and details of the process are available on the DBCA website. This is a separate process to the assessment currently being conducted by the EPA on this Proposal. |

## Terrestrial Environmental Quality

| Item | Submitter | Submission and/or issue | Proponent Response |
|---|---|---|---|
| 30 | ANON-W8X1-NPA3-A | A waste management plan has been referenced in the ERD; however, it has not been provided for review. | The Waste Rock Management Plan is provided as Appendix 35 to the revised ERD (Rev 5). |
| 31 | ANON-W8X1-NPA3-A | The submitter considers that the Traditional Owners have not supported on-site landfills, and that waste should be transported off-site to an appropriate facility. | On site disposal of waste remains a proposed element of the project and will be subject to regulation under Part V of the EP Act.<br><br>HPPL will prioritise the re-use and recycling of waste material where possible, with only residual waste being disposed on site.<br><br>The transport of wastes off site would create additional traffic, emissions and would be subject to the same regulatory controls as an on-site facility, only on different jurisdiction. |
| 32 | ANON-W8X1-NPA3-A | The Wittenoom Asbestos Management Area is incorrectly stated as being 13 km from the development envelope (section 3.13.4 of the ERD). | HPPL incorrectly stated this within the ERD. The north-eastern corner of the Wittenoom Asbestos Management Area is approximately 4.3 km from the western most point of the Development Envelope. This has been updated in the ERD. |
| 33 | ANON-W8X1-NPA3-A | The submitted considers that the Traditional Owners have not been adequately consulted on the potential impacts from failure of pipelines containing saline water, and that the proposed management measures do not adequately address the potential impacts to terrestrial environmental quality. | HPPL remains committed to managing the risk of saline water leaks through appropriate engineering controls. All saline pipelines will be either bunded or equipped with telemetry and/or pressure sensors to enable rapid detection and response to any leaks or failures.<br><br>The predicted salinity of the reinjection water (predicted to range between 1,700 and 4,200 mg/L TDS) in comparison to the baseline salinity.<br><br>The original commitment for bunding all saline pipelines was made when Managed Aquifer Recharge (MAR) activities were proposed within the Fortescue Valley area, which holds ethnographic significance for the Traditional Owners. Since then, the Project Development Envelope has been amended to relocate MAR activities outside of Fortescue Valley and significantly reduce the volume and salinity of water involved. As a result, the risk of surface water contamination has been materially reduced.<br><br>Given these changes, the revised approach utilizing telemetry, pressure sensors, bunding, or a combination thereof is considered proportionate and effective in managing residual risk. HPPL remains open to further engagement to ensure these measures are clearly understood and appropriately implemented. |

## Air Quality

| Item | Submitter | Submission and/or issue | Proponent Response |
|---|---|---|---|
| 34 | ANON-W8X1-NPA3-A | It is not clear if air quality monitoring is proposed to occur at the Wirrilimarra community, as indicated in Table 13-3 of the ERD. | HPPL has commenced engaging with the Wirrilimarra Community, through BNTAC as an intermediary, regarding the Proposal. Feedback has been received in relation to the Proposal's impact on the Wirrilimarra community both formally and informally through BNTAC members. Consultation with Wirrilimarra community will be ongoing throughout the Proposal lifecycle. HPPL also intend to request permission to monitor at the Wirrilimarra community for any potential impacts as a result of indirect impacts such as dust or noise throughout construction and operation of the Proposal.<br><br>As a mitigation measure for impacts to air quality due to fugitive dust emissions resulting from the Proposal, HPPL has committed to dust monitoring at the Wirrilimarra and Youngaleena Communities (as outlined in Table 13-3 of the ERD). |
| 35 | ANON-W8X1-NPA3-A | The submitter considers that the proponent has not adequately considered industry-standard dust mitigation measures and will rely on the discharge of saline water to the environment to minimise dust emissions. Alternative methods of dust suppression should be considered. | Dust control measures will be implemented throughout the life of the Proposal and will include:<br>• Saline water (> 5,000 mg/L TDS) shall not be used for dust suppression.<br>• Sealed northern haul road (as detailed in Section 2.2.3.6 of the ERD).<br>• Dust suppression techniques (e.g. water trucks) shall be used on unsealed roads and access tracks, cleared areas and at locations of high dust risk.<br>• Vehicle speeds on haul roads, work and camp sites shall be reduced where necessary to minimise dust emissions.<br>• Vegetation clearing and earthworks during high winds (>50 km/hr) shall be avoided.<br>• Clearing activities will be staged to minimise areas of exposed surfaces<br><br>HPPL commit to trialling alternate dust suppression technologies from the commencement of mining and construction activities. |
| 36 | ANON-W8X1-NPA3-A | The proponent references Matsuki et al. (2016) as evidence that plant health is not adversely impacted by dust deposition. However, this study was conducted in a different environmental setting and should not be relied upon for the addressing the potential impacts from dust emissions in this area. | The Pilbara region of Western Australia is characterized by a semi-arid climate. Concerns have previously been raised about the ecological impacts of dust emissions from mining activities, particularly regarding vegetation health. The findings of Matsuki et al. (2016), which report no significant negative impacts of dust deposition on plant health in semi-arid environments, are considered relevant to the Pilbara because the environmental conditions in the Pilbara—low annual rainfall, high temperatures, and sparse vegetation—mirror those of the semi-arid environments studied in their work. Their findings suggest that plants in such regions may exhibit a degree of resilience or adaptation to intermittent dust deposition.<br><br>In addition, local flora—such as spinifex grasses and acacias—are known to have evolved mechanisms to tolerate harsh environmental conditions, which may include periodic dust accumulation on leaves and stems. |

## Social Surrounds

| Item | Submitter | Submission and/or issue | Proponent Response |
|---|---|---|---|
| 37 | ANON-W8X1-NPA4-B | The Mungurrdu area is significant to the Banjima People, and the proponent should ensure they involve the Banjima People in the monitoring and management of the potential impacts to the Fortescue River, including any pools. | The Mungurrdu heritage site (40484) was lodged with DPLH and covers a significant portion of the Fortescue River Valley. The Fortescue Valley is part of a songline which extends the length of the Fortescue River to where it goes below ground at Millstream (Goode, 2009)2. Mungurrdu is located outside but immediately south of the Development Envelope.<br><br>Mining activities that contribute to altered hydrological and hydrogeological regimes including pit dewatering, MAR and changes to surface water flows have the potential (without appropriate management) to indirectly impact areas in the vicinity of the Development Envelope including the Mungurrdu site and the Koodjeepindarrnna and Ngarlganoona pools.<br><br>HPPL has proposed management measures to prevent impacts to Mungurrdu and the Koodjeepindarrnna and Ngarlganoona pools from changes to groundwater and surface within the WMP (ref response to items 15, 16, 17, 18, 19 and 20).<br><br>BNTAC and their technical advisors have reviewed previous of the WMP and will be provided the opportunity to review subsequent versions of the plan as it is updated through the life of the Project.<br><br>HPPL intends to involve Banjima People in water monitoring and implementation of the WMP. HPPL and BNTAC are currently working together to design a Co-Management Charter which establishes a process to support this intention. |

[2] Goode, B. 2009. Report on an Ethnographic Aboriginal Heritage Survey of the Christmas Creek Hydrological System, Western Australia. Unpublished Report Prepared for Fortescue Metals Group Pty Ltd and the Nyiyaparli Native Title Claimants, August 2009. Brad Goode & Associates Consulting Anthropologists & Archaeologists, Dunsborough, WA.

| Item | Submitter | Submission and/or issue | Proponent Response |
|---|---|---|---|
| 38 | ANON-W8X1-NPA3-A | The proponent has not adequately consulted with relevant parties on the potential impacts to values of social surroundings.<br><br>The recommendations put forward during consultation with the Banjima People do not appear to have adequately considered.<br><br>The Youngaleena and Wirrilimarra communities are near the proposal and have not been adequately consulted on the potential impacts. These communities should also be included on maps, where appropriate, to visual the proximity to the proposal.<br><br>The post-closure landform should include sufficient consultation with relevant stakeholders, such as the Banjima People. | HPPL acknowledge the location of the Proposal being situated on the lands of the Banjima People, the presence of the two Aboriginal communities of Youngaleena and Wirrilimarra, and the significant social surroundings values.<br><br>HPPL has undertaken extensive consultation with the Banjima Traditional Owners through BNTAC since 2021, including multiple agreement negotiation meetings, Hancock Heritage and Environment Reference Committee (HHERC) meetings, on-country consultations, ethnobotanical surveys, heritage surveys and meetings with BNTAC's technical advisors. The key issues and outcomes from these engagements have informed the identification of Social Surroundings Values and the assessment of impacts in the WA EP Act ERD.<br><br>The Proposal has been revised under section 43A of the EP Act as an outcome of these consultations through the assessment of potential direct and indirect impacts. A summary of consultation outcomes with Banjima Traditional Owners on Proposal design and avoidance and minimisation measures implemented is provided in Attachment 2.<br><br>Overall, with the implementation of mitigation actions as formalised through the Part IV EP Act approval process, impacts to Social Surroundings will be managed as such that the EPA's objectives for this factor can be met. This will be managed via ongoing consultation with Banjima Traditional Owners and other stakeholders identified above.<br><br>Maps constructed and used throughout the ERD are in place to assist the reader, illustrating the topic/content/data of the relevant section. The design of maps is intended to be simplified, only showing information relevant to the section in which the figure is cross-referenced.<br><br>Three figures within the ERD, Figures 3-16, 7-38 and 14-2 show the location of Youngaleena and Wirrilimarra communities in relation to the Proposed Action Area. Figure 3-16 is relevant to land use adjacent to the Proposed Action Area, for which Youngaleena and Wirrilimarra communities have been identified. Figure 7-38 illustrates the maximum extent of impacts to water level change, identifying that Youngaleena and Wirrilimarra communities are identified outside of this impact area. Figure 14-2 is relevant to surrounding communities and sensitive receptors, for which Youngaleena and Wirrilimarra communities have been identified.<br><br>The symbolism of showing the location of the communities on all maps, even if irrelevant to the purpose of that map, is not significant noting that the impact on each community has been considered in the impact assessment.<br><br>HanRoy is committed to preparation of a Mining Development and Closure Proposal (MDCP) and subsequent Mine Closure Plan (MCP) in accordance with the *Mining Act 1978* and *Mining Regulation 1981*.<br><br>The Traditional Owners are a key stakeholder to the Project, as such it is important to understand and manage expectations and work to mitigate the risk of direct impacts related with the Mine.<br><br>As part of continuing key stakeholder engagement, HPPL is working with the Traditional Owners to undertake collaborative risk assessment and mine closure workshops for the Project and provide them the opportunity to review and comment on the informed draft MDCP and subsequent MCP prior to submission to DEMIRS. Additionally, consultation undertaken during a recent HHERC meeting has resulted in a HPPL commitment to undertaking artificial light modelling and air quality modelling to determine impacts on the communities of Youngaleena and Wirrilimarra. These works are currently underway. |

| Item | Submitter | Submission and/or issue | Proponent Response |
|---|---|---|---|
| 39 | ANON-W8X1-NPA3-A | The ERD does not adequately describe the social and environmental values associated with Banjima country, such as important cultural sites or plants used for traditional purposes.<br><br>Further work is required to understand the values present, including further survey work to build a comprehensive ethnobotanical report and dataset.<br><br>Based on this additional survey work, the proponent should create or adapt management measures to avoid, and otherwise minimise, impacts to culturally significant flora (e.g., avoid clearing of important species, or relocating species where this is not possible). | HPPL has consulted with the Banjima People from the early stages of the Project, utilising multiple methods and engagement opportunities. This has provided ample opportunity for Banjima to consider the impact of the Project and to provide feedback and raise concerns. Consequently, due to Banjima's feedback the Proposal has been significantly redesigned which has resulted in the Proposal significantly decreasing in scope from 20 Mtpa to 12 Mtpa.<br><br>The Proposal has been revised under section 43A of the EP Act as an outcome of these consultations through the assessment of potential direct and indirect impacts. A summary of consultation outcomes with Banjima Traditional Owners on Proposal design and avoidance and minimisation measures implemented is provided in Attachment 2 - Summary of consultation outcomes with Banjima Traditional Owners on Proposal design and avoidance and minimisation measures.<br><br>HPPL continues its consultation with Banjima through HHERC meetings, Project negotiation meetings, meetings with the BNTAC Board, as well as meetings with the BNTAC corporate team and their consultant advisors.<br><br>One ethnobotanical survey has been undertaken to date for the Proposal, in July 2024. HPPL is committed to further ethnobotanical and ethnozoological consultation with Banjima Traditional Owners as required. Where the outcomes of ethnobotanical survey determines areas of ethnoecological importance, HPPL will incorporate appropriate management measures into an SCHMP and relevant management procedures.<br><br>HPPL maintains its commitment to the co-development of a SCHMP with Banjima, in which aspects of social and environmental of value to Banjima will be further defined with appropriate adaptive management strategy put in place. |
| 40 | ANON-W8X1-NPA3-A | The proposal may have long-term impacts on visual amenity and access to country, which is not adequately addressed in the ERD.<br><br>The proponent should provide further detail on the potential post-closure impacts on values of social surroundings. Further management measures are required to minimise the potential impacts, and the management measures should be consistent with industry standards and benchmarking. | HPPL acknowledge the location of the Project being situated on the lands of the Banjima People, the presence of the two Aboriginal communities of Youngaleena and Wirrilimarra, and the significant social surroundings values.<br><br>HPPL has undertaken extensive consultation with the Banjima Traditional Owners through BNTAC since 2021, including multiple agreement negotiation meetings, HHERC meetings, on-country consultations, ethnobotanical surveys, heritage surveys and meetings with BNTAC's technical advisors. The key issues and outcomes from these engagements have informed the identification of potential impacts to the Banjima people in the ERD (including visual amenity and access to country).<br><br>HPPL is committed to preparation of a Mining Development and Closure Proposal (MDCP) and subsequent Mine Closure Plan (MCP) in accordance with the Mining Act 1978 and Mining Regulation 1981.<br><br>The DEMIRS guidance for preparing MCPs (DEMIRS, 2025) is consistent with industry leading best practice and is based on the principle that planning for mine closure be an integral part of mine development and operations planning. |
| 41 | ANON-W8X1-NPA3-A | The submitter considers that the proponent has not adequately consulted with the Traditional Owners about impacts to heritage sites thus far.<br><br>Since 2023, the submitted considers that the Banjima people have become aware of at least 54 heritage places that have been impacted by pastoral or mineral exploration activities without consent under section 18 of the Aboriginal Heritage Act 1972. | Heritage audits and reviews of prior ground disturbing activities against heritage site boundaries have been undertaken and the results communicated to both BNTAC and Karijini Development Pty Ltd in a letter dated 31 October 2023. Since issuance of this letter, two additional heritage events have been reported to BNTAC. |

| Item | Submitter | Submission and/or issue | Proponent Response |
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| 42 | ANON-W8X1-NPA3-A | The cumulative impacts to Aboriginal cultural heritage have not been adequately addressed.<br><br>The submitter considers that there are a large number of proposals across Banjima Country, and that has resulted in significant cumulative impacts to social surroundings values. For example, destruction of cultural heritage, loss of access to Country, loss of culturally significant flora and fauna, abstraction of groundwater, dust emissions, and so on.<br><br>Cumulative impacts to social surroundings values should be assessed across the Banjima Native Title Determination Area. | To date, HPPL has continued to apply the mitigation hierarchy to the Proposal. This is illustrated through three Section 43a amendments submitted during the State environmental approval process which have reduced the Proposal area and associated activities. Additionally, HPPL have incorporated BNTAC/Banjima comments into mitigation measures. In doing so, HPPL has reduced the environmental impact of the proposed action and consequentially, the cumulative environmental impact.<br><br>As set out in the draft Project Agreement currently under negotiation, it is proposed that Hancock will support and participate in initiatives established by BNTAC to consider and investigate the cumulative impacts of mining, including by engaging with other mining proponents at BNTAC's request.<br><br>As set out in Section 17.8 of the ERD, cumulative impacts to social surroundings have been assessed across the Banjima Native Title Determination Area. |

**Submitter References**

Environmental Protection Authority (EPA) 2021, Technical guidance – Subterranean fauna surveys for environmental impact assessment, EPA, Western Australia.

# 1. References

AQ2. 2024. *Mulga Downs - Groundwater, Surface Water & Ecohydrological Impact Assessment.* Perth: AQ2.

AQ2. 2025a. *Mulga Downs - Groundwater, Surface Water and Ecohydrological Studies Baseline Assessment.* Perth: AQ2.

AQ2. 2025b. *Mulga Downs: Responses to EPA Comments.* Perth: AQ2.

DBCA. 2024. *Guidelines for determining the likely presence and habitat usage of Night Parrot (Pezoporus occidentalis) in Western Australia.* Perth: Department for Biodiversity Conservation and Attractions.

DPaW. 2017. *Interim guideline for preliminary surveys of night parrot (Pezoporus occidentalis) in Western Australia.* Perth: Department of Parks and Wildlife.

## 2. Attachment 1 – Figures

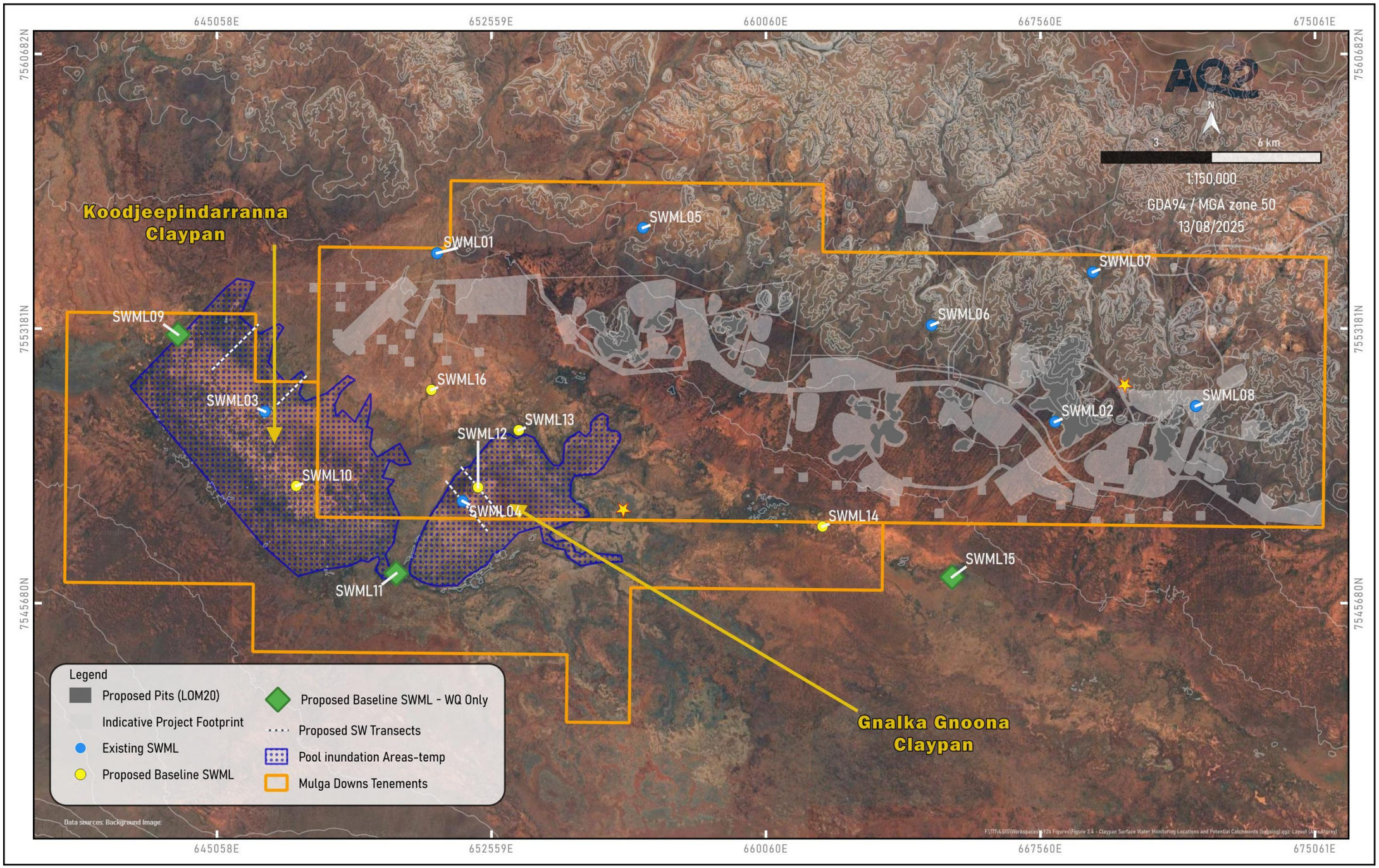


**Figure 1: Proposed Full Baseline Surface Water Monitoring Network**

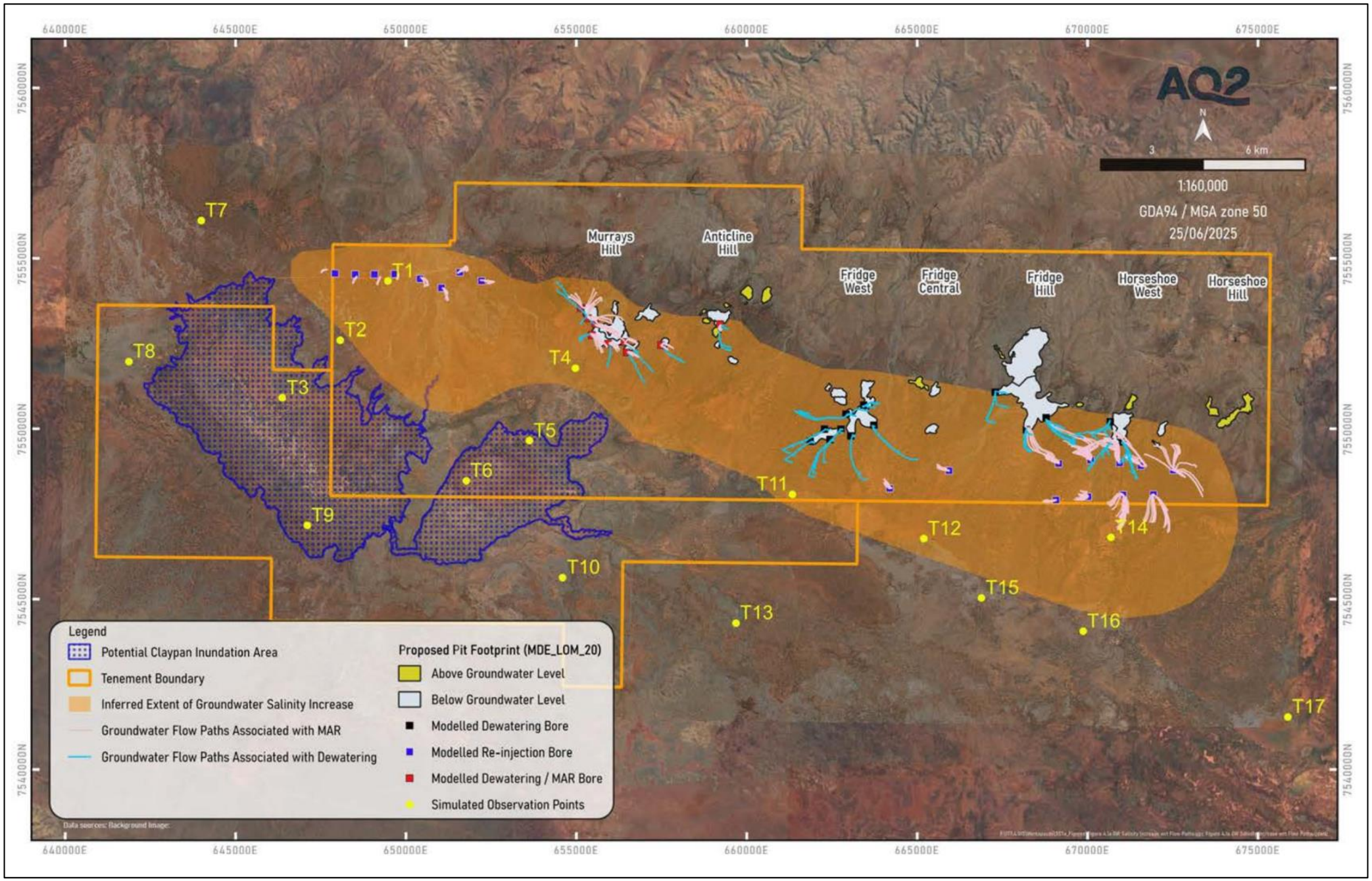


**Figure 2: Inferred Extent of Groundwater Salinity Increase Based on Model Predictions - Inferred Extent with Predicted Flow Paths and Simulated Observation Points**

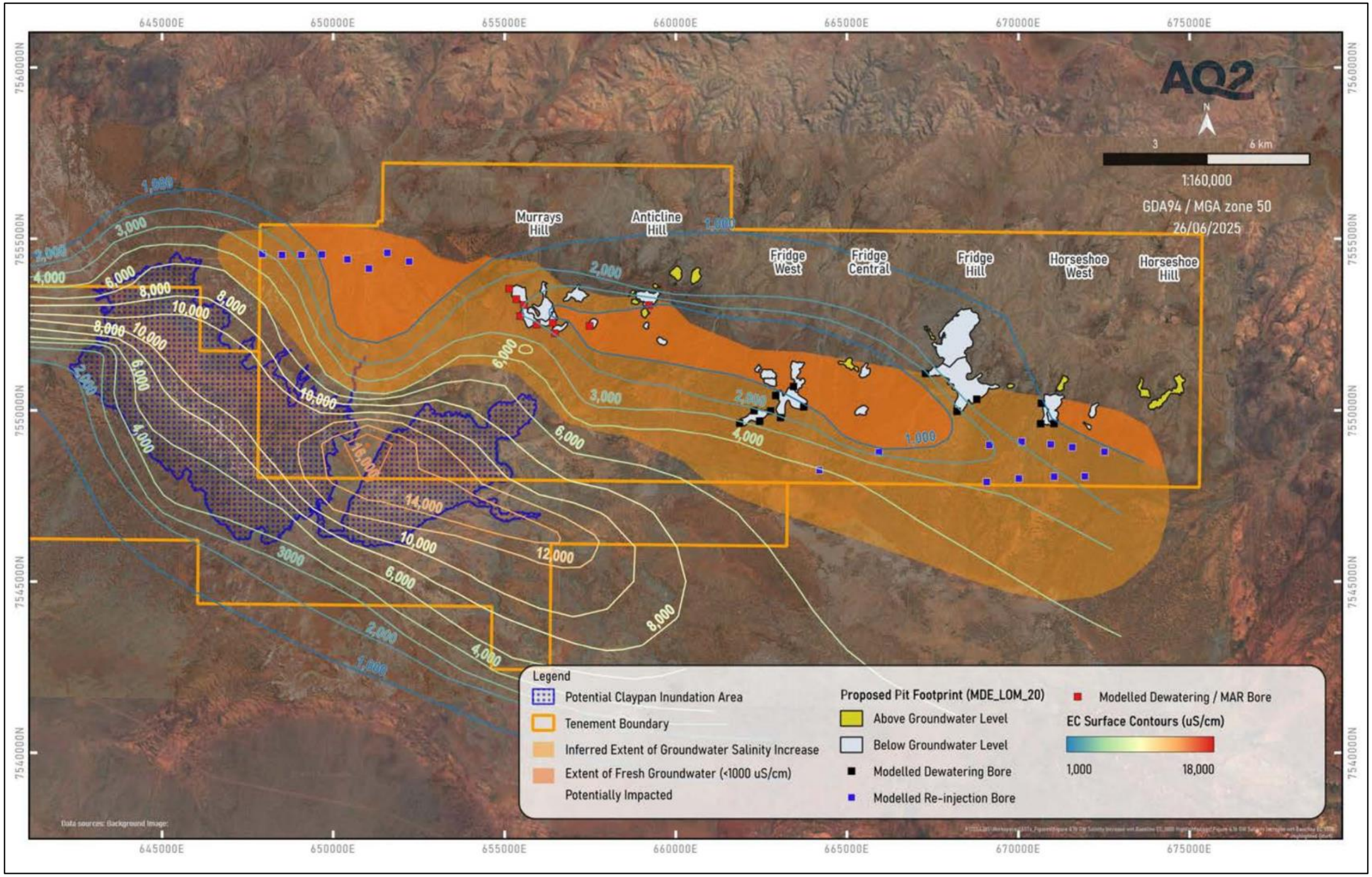


**Figure 3: Inferred Extent of Groundwater Salinity Increase Based on Model Predictions - Inferred Extent with Baseline EC Contours at Groundwater Level**

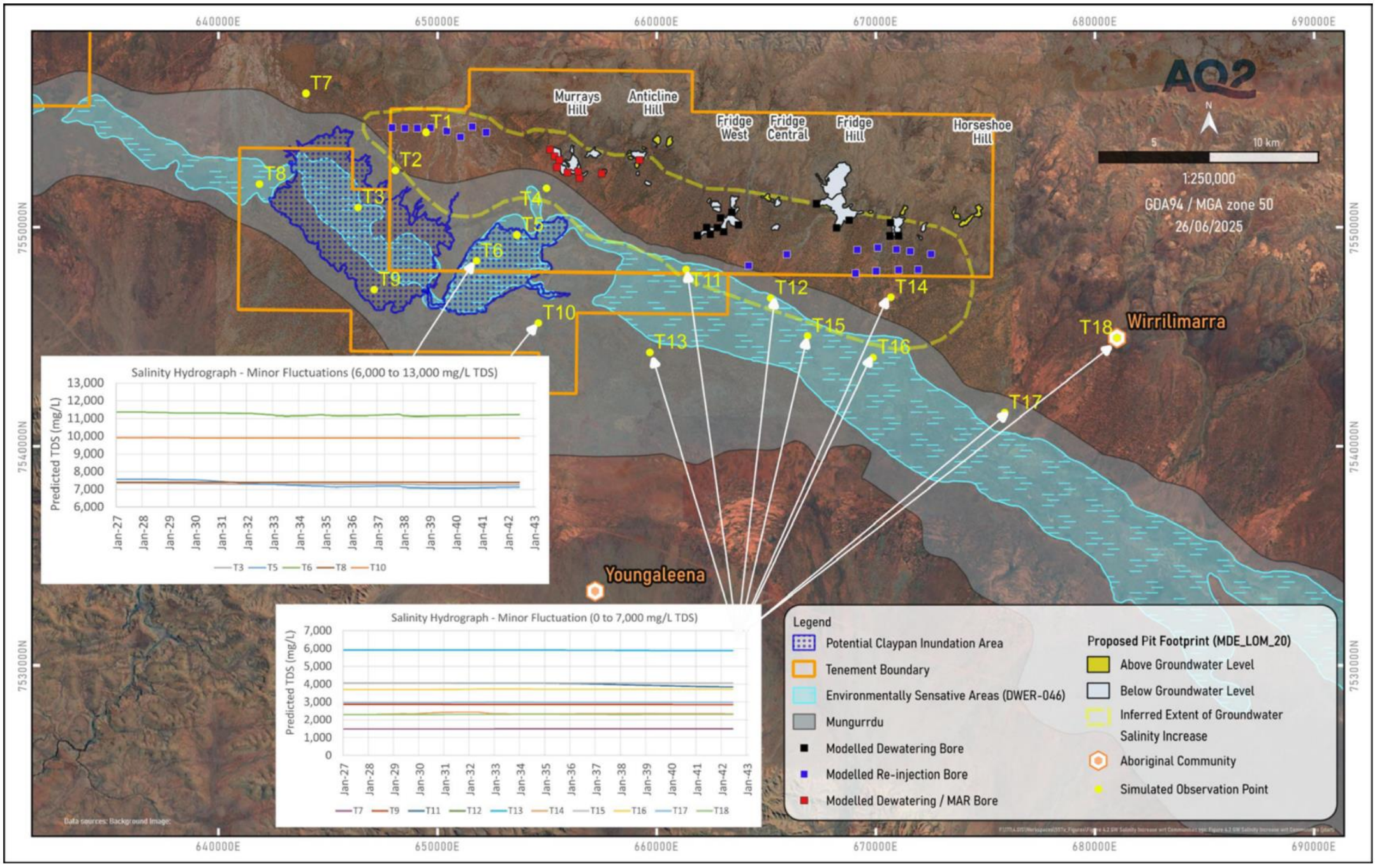


**Figure 4: Inferred Extent of Groundwater Salinity Increase in Relation to Youngaleena and Wirrilimarra**

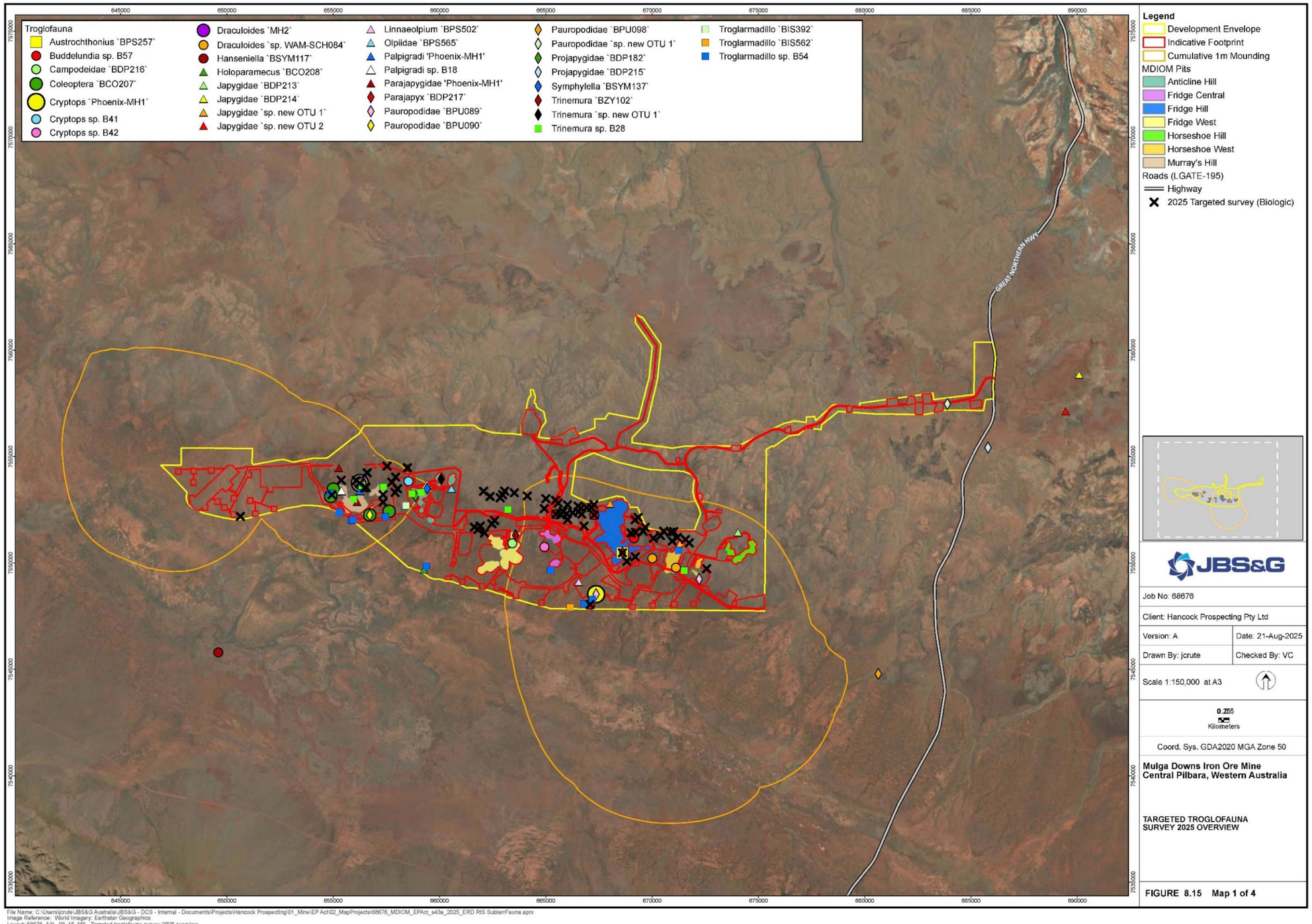


**Figure 5: Location of potential SRE Troglofauna and sampling sites for the 2025 targeted troglofauna survey**

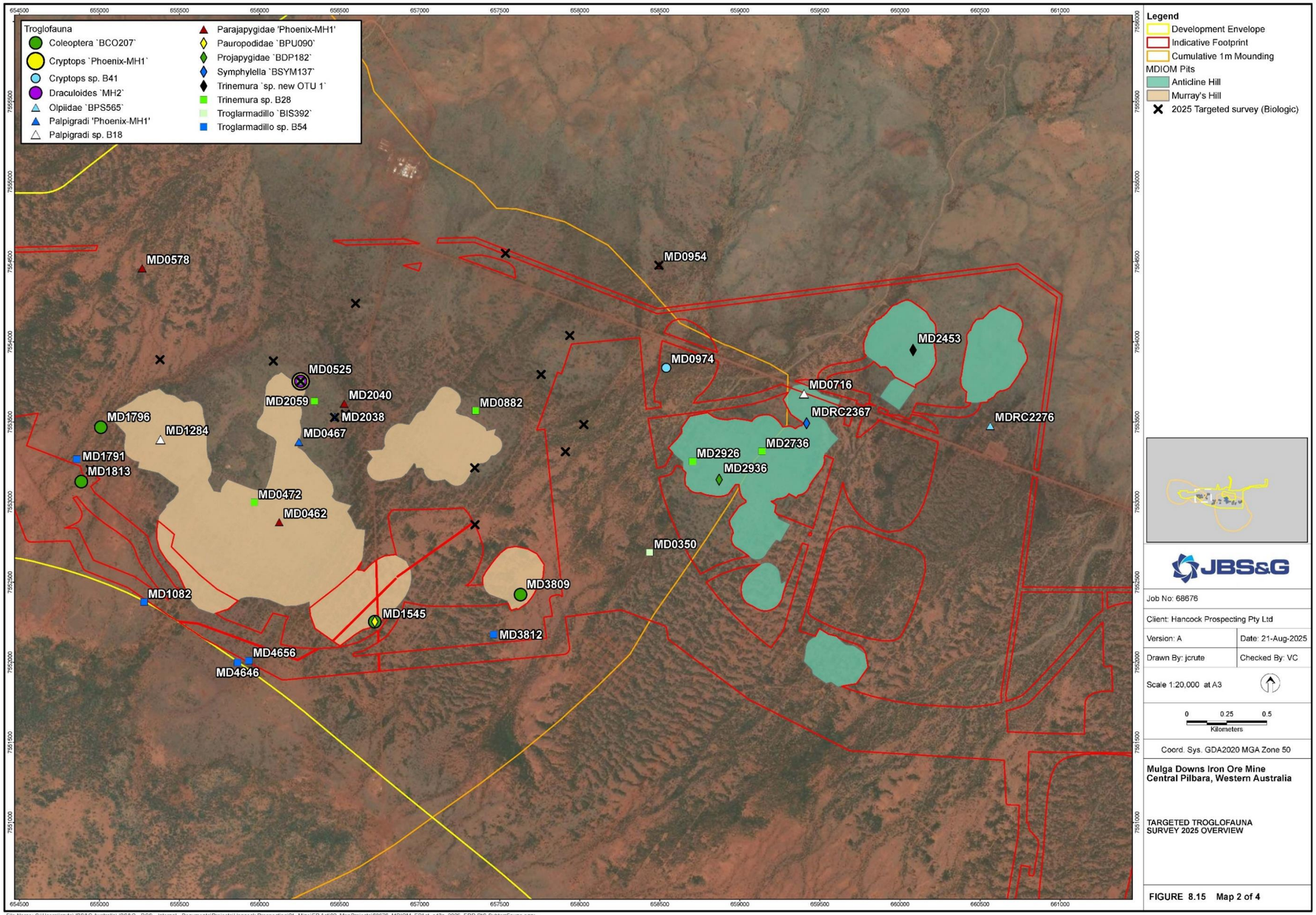


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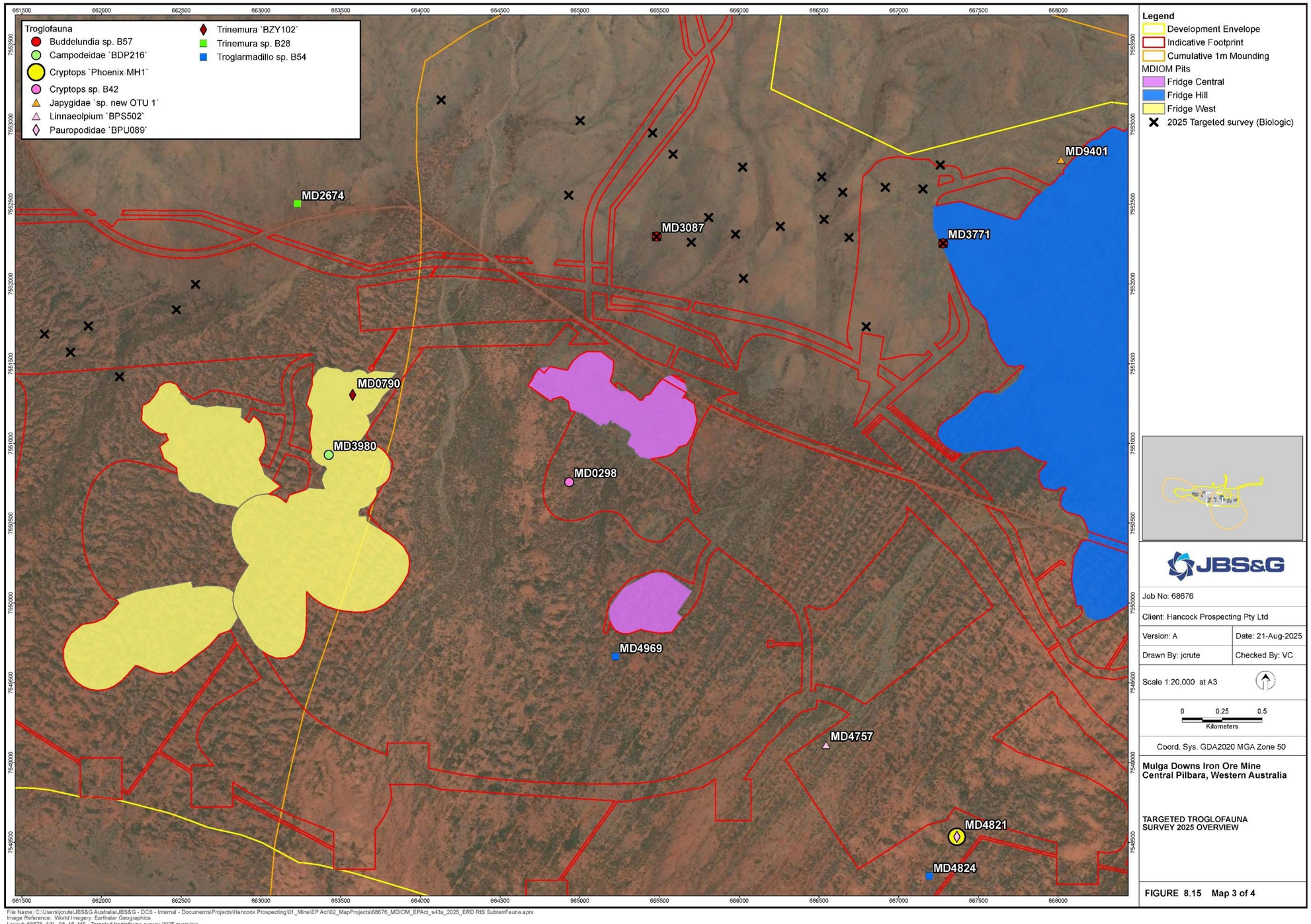
Image Reference: World Imagery: Maxar
Layout: 68676_A3L_08_15_MS_ Targeted troglofauna survey 2025 overview

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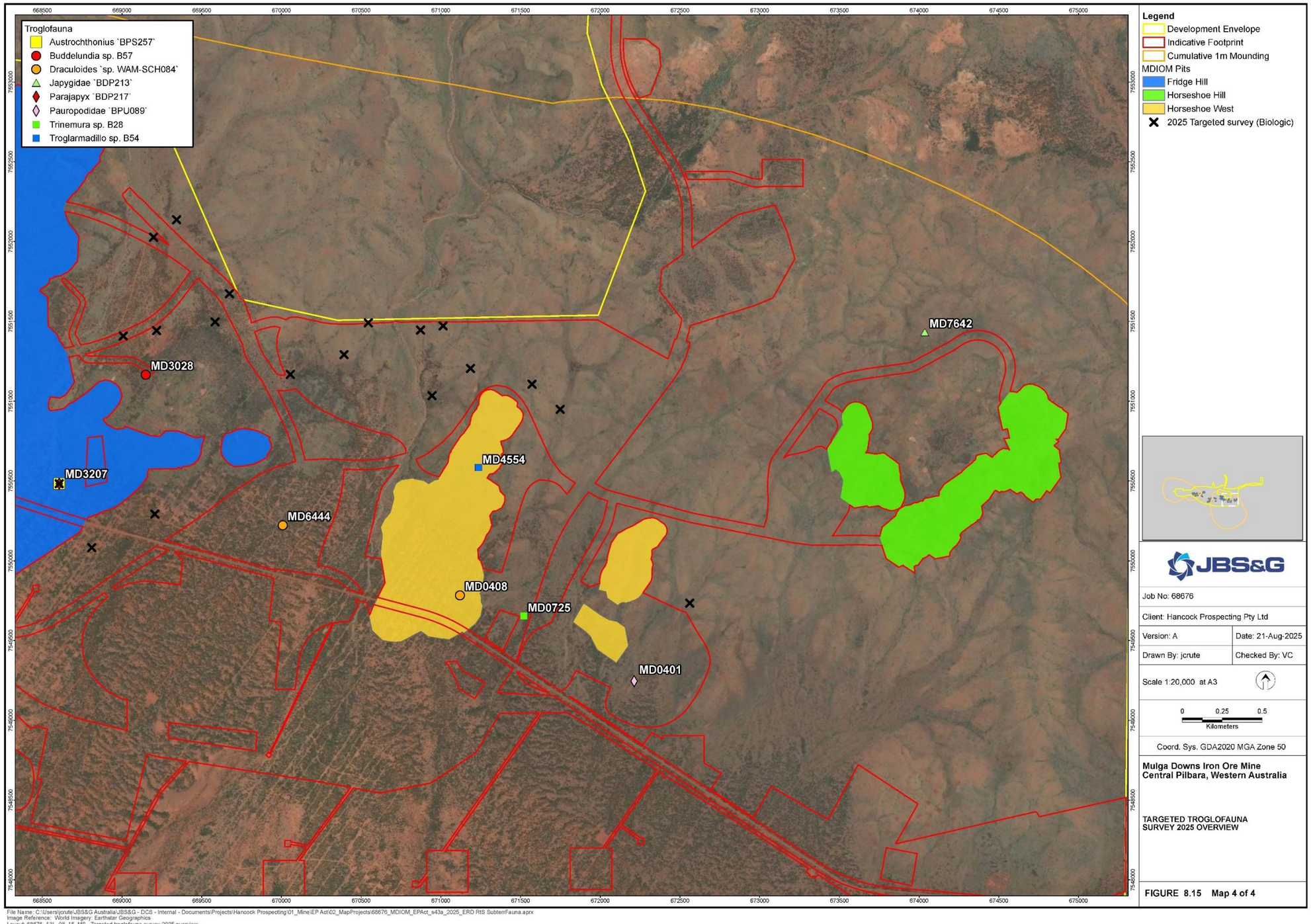


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Image Reference: World Imagery: Earthstar Geographics
Layout: 68676_A3L_08_15_MS_ Targeted troglofauna survey 2025 overview

# 3. Attachment 2 - Summary of consultation outcomes with Banjima Traditional Owners on Proposal design and avoidance and minimisation measures.

| Theme | Issue Raised | Avoidance and Minimisation Measure Implemented |
|---|---|---|
| Location of Proposal elements | Banjima Traditional Owners raised during consultation that the originally proposed airport and camp locations were in the vicinity of key cultural areas located to the west of the Development Envelope. | The airport and camp locations have been relocated (to the west and south respectively) to avoid key cultural areas being located further away from the identified cultural areas of significance. |
| Water | Water was identified as a key focal area for Banjima Traditional Owners. Both groundwater and surface water were raised, as well as responsible use of water and concern about the location and extend of managed aquifer recharge required for the Proposal.<br>Identified potential indirect impacts to the DPLH lodged Mungurrdu heritage (40484) site through altered hydrological and hydrogeological processes was also raised. | Through the s43 application approved on 4 October 2024, HPPL has significantly reduced the amount of dewatering required to construct and operate the Proposal, this in turn has significantly reduced the potential for indirect impacts on Mungurrdu through altered hydrogeology.<br>The Water Management Plan prepared for the Proposal was provided to the Traditional Owners and their advisors for review and input and the feedback provided has been considered in preparing revised versions. |
| Contamination | The Development Envelope for the Proposal is located in close proximity to Wittenoom Asbestos Management Area. Is there any potential for the DE to be contaminated from activities at Wittenoom? | Through the s43 application approved on 4 October 2024, the Development Envelope for the Proposal no longer intersects the WAMA. There will no longer be ground disturbing works within the WAMA and therefore the potential impacts associated with the redistribution of ACM is reduced. |
| Cultural Heritage and Social Surroundings | The Proposal is located within an area that contains significant heritage and cultural associations. The original Proposal also included mining activities and supporting infrastructure within the DPLH lodged Mungurrdu heritage site.<br>The original Proposal Development Envelope and footprint impacted directly on some key areas of significance the Banjima. | The Proposal was amended from what was originally referred (20 Mtpa) to the reduced 12 Mtpa mine removes any mining and associated mining infrastructure from within the lodged Mungurrdu heritage site. There is no longer the requirement for any dewatering infrastructure to be constructed and operated within Mungurrdu.<br>Throughout the design process, the Development Envelope and Indicative Footprint has been amended to avoid impacts to key cultural areas. |
| Wirrilimarra Community | Previous mine access road (referred to as 'Fenceline Road') was too close to the Wirrilimarra Community. | HPPL has now designed the 'northern haul road' to facilitate mine access and haulage of ore. The new route is located approximately 12 km to the north of Wirrilimarra at its closest point, and the 'Fenceline Road' has been removed from the Development Envelope. |

# 4. Attachment 3 - Mulga Downs: Responses to EPA Comments (AQ2 2025b)

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# Memo

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|---|---|---|---|
| To | Dylan Asgill-Tucker / Brett McGuire | Company | HanRoy |
| CC | Luke Dunn / Bobak Willis-Jones | | HPPL |
| From | Mark Nicholls / Emma Bolton | Job No. | 171X |
| Date | 28/8/25 | Doc No. | 561b |
| Subject | Mulga Downs: Responses to EPA Comments | | |

Dylan / Brett,

Please find below our responses to the comments received from the EPA on 2nd July 2025 regarding HanRoy's Mulga Downs ERD submission. We note that some of the EPA comments have originated from BNTAC and have already been responded to in a separate memo (AQ2 Doc Ref: 171X_557b, dated 27th June 2025). As such, we have not included those comments and responses in this document.

Where sections or figures from the Mulga Downs Water Management Plan (WMP) or the ERD and related supporting documents have been referred to, the relevant extracts are presented as Attachments to this report.

Relevant ERD supporting documents include:

- Mulga Downs Groundwater, Surface Water and Ecohydrological Studies – Baseline Assessment. Report (AQ2 2025).
- Mulga Downs Groundwater, Surface Water and Ecohydrological Impact Assessment Report (AQ2 2024).

## 1. EPA COMMENT 3

### 1.1 Comment

*"It is not clear what the full extent of impacts to the Mitchell grass plains (Astrebela spp.) on the gilgai of the Wona Land System Priority Ecological Community (PEC) will be as indirect impacts (e.g. changes to surface water hydrology) do not appear to have been fully considered.*

*Similarly, the potential indirect impacts to the Freshwater claypans of the Fortescue Valley PEC remain uncertain, as potential impacts via groundwater drawdown and mounding are based on conceptual hydrological modelling. In comparison to other claypans in the Fortescue Valley, claypans on the Mulga Downs Station are larger, provide greater variety of habitat, have a diverse floral community, support unique and restricted invertebrate species, and support a high number and diversity of waterbirds (Pinder et al. 2017).*

*Further mitigation and management measures should be proposed to ensure the proposal does not adversely affect the Mitchell grass plains (Astrebela spp.) on gilgai of the Wona Land System PEC or the Freshwater claypans of the Fortescue Valley PEC."*

### 1.2 Response

#### Wona Land System PEC

Section 7.5 of the Baseline Report (AQ2 2025) provides the following summary of the ecohydrological characteristics for the Wona Land System (refer Attachment 1):

- Level to very gently inclined basaltic plains. Soils mostly comprise self-mulching cracking clays and some deep red-brown non-cracking clay with stony mantles.
- Minimal contribution to the catchments of the Fortescue Valley wetlands, mainly local infiltration.
- Tussock grassland communities predominantly rain fed.

The Wona Land System falls within the Basaltic Tablelands ecohydrological unit (EHU) with further details regarding the elements and processes of this EHU provided in Section 8.2 of the Baseline Report (AQ2 2025) (refer Attachment 1).

The proposed Project haul road crosses the boundaries of the mapped Wona Land System area and environmental culverts will be installed at drainage lines to allow distribution of flow across the road. The flatness of the land system means that transfer of water via runoff processes will be limited and direct rainfall on the land system will be the dominant source of water for vegetation.

The flood modelling (refer Sections 4.3 of AQ2 2025 & AQ2 2024) has simulated the Wona Land System (Basaltic Tablelands) by applying a high roughness coefficient and rainfall losses to simulate the retention of water within the land system. The flood difference mapping indicates limited changes to flow depths in the drainage lines which cut through the Wona Land System due to construction of the haul road (which has been simulated without any culverts).

#### Freshwater Claypans of the Fortescue Valley PEC

The Conservation Significant Fauna Management Plan (CSFMP) will be revised to include commitments to assess the hydroperiod and water recession rates from the claypans following large rainfall events to identify if mining is impacting the retention of water within the claypans from pre-development conditions. The WMP includes commitments to continue baseline water quality and water flow monitoring for the claypans to build on the baseline hydrological knowledge-base.

## 2. EPA COMMENT 16

### 2.1 Comment

*"Section 7.3.7.2 of the ERD describes four surface water fed pools as local receptors. However, Figure 7-29 identifies 5. Clarity should be provided on the characterisation and ecological values of this additional pool, and any potential direct or indirect impacts."*

### 2.2 Response

The ERD notes that "Several small, surface water fed channel pools that hold water for a period of time following runoff events, in the Fortescue Valley, south of the Development Envelope occur." The ERD lists four examples of channel pools with the introductory text "These pools include (but are not limited to):". The four pools which are listed are all located downstream (south) of the mining area consistent with the introductory paragraph. The fifth pool, which is shown in Figure 7-29, is located on the northern side of the Development Envelope.

The report section and figure referred to above are provided in Attachment 2 of this document.

# 3. EPA COMMENT 17

## 3.1 Comment

*"It is unclear whether the bores in white in Figure 1-4 (and Figure A3-1) of the WMP represent pastoral bores only, or whether there are bores with other uses. It is also unclear whether the bores as shown by the 'Community' symbol are the only bores used by communities, or whether any other bores in Figure 1-4 are also utilised. Further, Figure 1-4 should be updated to include Rio Tinto and Fortescue operational bores.*

*Clarification should be provided on which bores will be monitored for changes to groundwater chemistry (Table 2-3 of the WMP).*

*It is unclear whether pastoral, community, and industry bores located near or within the predicted drawdown and mounding areas will form part of the monitoring network.*

## 3.2 Response

The figures and report sections referred to in this response are provided in Attachment 3 of this document.

### Groundwater Users

Figure 1-4 in the WMP presents the locations of the Youngaleena and Wirrilimurra Communities as well as bores and wells from DWER's Water Information Reporting (WIR) database. Predominantly these are pastoralist water supplies, although some (if not all) of the unnamed bores in the vicinity of Wirrilimurra, are associated with Fortescue's White Knight exploration area.

Figure 3.1 and Table 3.1 (both below) present the currently licensed draw points (bores) and groundwater well licence (GWL) details under the Rights in Water and Irrigation Act 1914. This includes the licenced water supplies associated with the Fortescue (Solomon) railway and RTIO (Goodiadarrie) railway referenced in the Section 1.9 of the Impact Assessment (AQ2 2025). It should be noted that the status of these licenced bores is uncertain. In particular, there is no evidence of any bore or access track for the Fortescue draw points plotted in the Mungurrdu (valley) area.

Table 3.1 GWL Licence Details

| GWL Number | Issue Date | Expiry Date | Annual Allocation (KL) | Licence Holder | Aquifer |
|---|---|---|---|---|---|
| 158473 | 17/06/2024 | 16/06/2034 | 45,000 | Pilbara Iron Company (Services) Pty Ltd | Hamersley - Fortescue |
| 171847 | 15/09/2017 | 15/09/2027 | 45,000 | Pilbara Iron Company (Services) Pty Ltd | Wittenoom - Wittenoom |
| 174412 | 18/02/2025 | 17/02/2035 | 100,000 | Fortescue Ltd | Hamersley - Fortescue |
| 174541 | 17/10/2014 | 16/10/2024 | 100,000 | Fortescue Ltd | Hamersley - Fractured Rock |
| 202550 | 19/11/2020 | 18/11/2030 | 2,000,000 | Pilbara Iron Pty Ltd | Hamersley - Fortescue |
| 203599 | 14/11/2019 | 13/11/2029 | 40,000 | Main Roads | Hamersley - Fortescue |
| 207984 | 1/11/2022 | 31/10/2032 | 99,000 | Fortescue Ltd | Hamersley - Fortescue |
| 207985 | 1/11/2022 | 31/10/2032 | 99,000 | Fortescue Ltd | Hamersley - Fortescue |

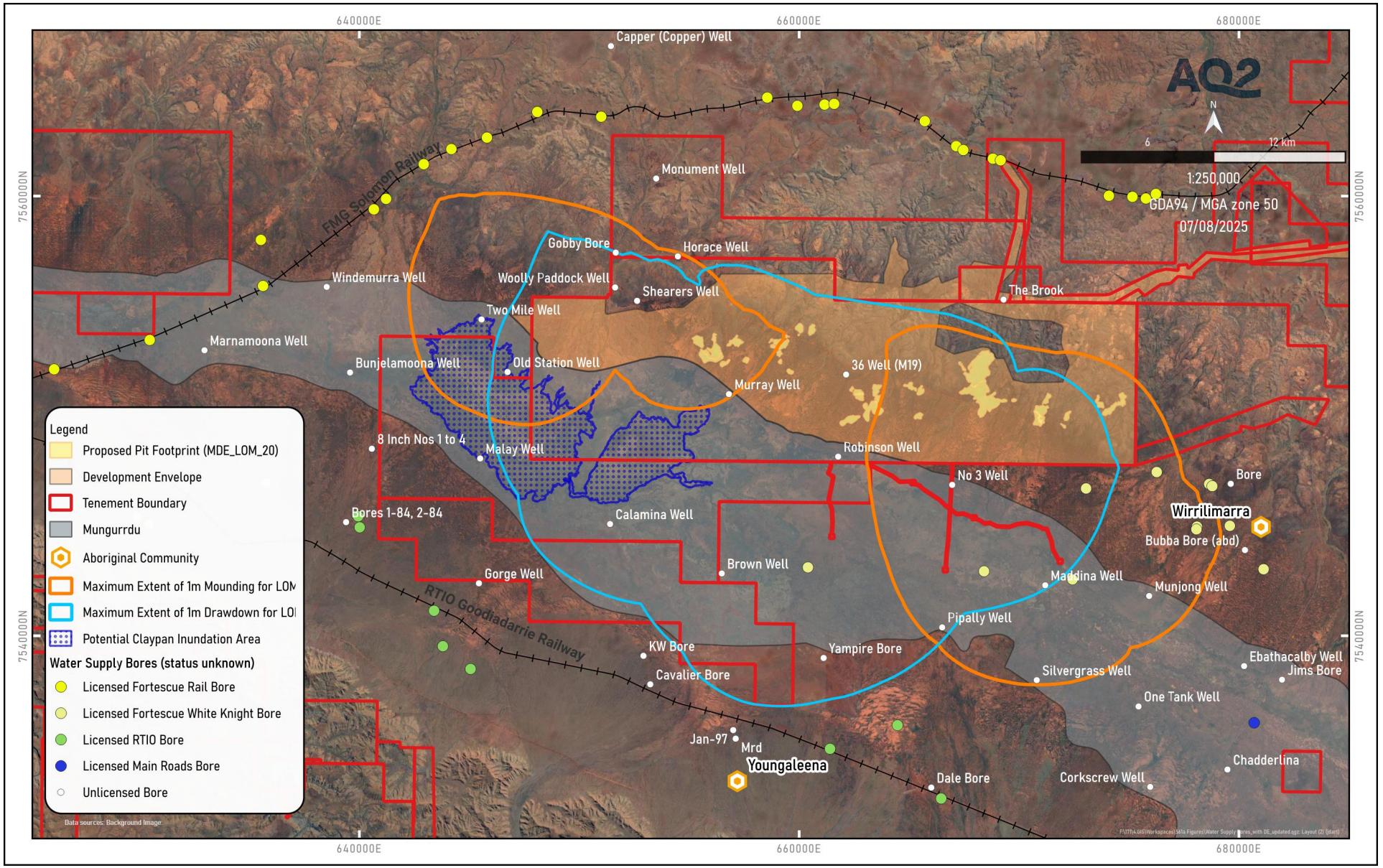


Figure 3.1 Water Supply Bores within the Predicted Area of Groundwater Level Change

AQ2 / HanRoy were invited to visit the Youngaleena Community in November 2024. The main Youngaleena water supply is managed by the Water Corporation under their Aboriginal Communities Water Services program with the bore located within the community grounds. A nearby bore, located ~75 m to the north (still within the community) is sometimes used for irrigation but had not been used for some time. Another bore, ~2 km north of the community, coinciding with that labelled as "Mrd" in the WIR database (and shown on Figure 1-4 in the WMP) was reported to sometimes be used for other purposes (i.e., ceremonies) but, again, had not been used for some time.

Details regarding the Wirrilimurra water supply bore(s) are unknown, despite HanRoy requesting this information through BNTAC.

### Groundwater Chemistry Monitoring

Those bores shown as Salinity Monitoring Bores (Figure A3-4 of the WMP) will be monitored for changes to groundwater chemistry (as per Table 2-3 of the WMP). Additional bores for water quality monitoring will be identified within the mine site area (i.e., downstream of waste rock dumps etc) prior to operations.

### Bore Monitoring Network

Where possible (i.e., access approval permitting), it is intended that, prior to operations, a survey of mapped water supply bores near or within the predicted drawdown and mounding areas will be undertaken to assess the bore status and baseline conditions. It is assumed that on-going access to community and industry bores will not be permitted, however, some pastoralist bores are likely to be incorporated into the bore monitoring network.

It should be noted that the planned monitoring bore network (as depicted in Figures 4-1, A3-2, A3-3 and A3-4 of the WMP) includes bores located between the proposed dewatering / MAR borefields and community and industry water supply bores such that any potential impact to these water supplies can be identified well in advance. Should a trigger level be identified at one of these monitoring bores, as per Table 3.1 of the WMP, HanRoy will, "in conjunction with the stakeholder developed agreed threshold value and action plan to ensure continuity of suitable quality water is available."

We note that Figure 4-1 should have been incorporated in Appendix 3 of the WMP as Figure A3-1 (instead of the Ground User Water Supply Bores figure). This may have led to the confusion.

## 4. SUBMISSION COMMENT 15

### 4.1 Comment

*"Groundwater drawdown is likely to have significant impacts on ecological communities, the Fortescue River, and further reduce water levels at the Karijini National Park."*

### 4.2 Response

The figures and report sections referred to in this response are provided in Attachment 4 of this document.

As documented in the groundwater, surface water and ecohydrological baseline report (AQ2 2025), no groundwater dependent vegetation has been identified in the study area (refer Executive Summary). Further, the low salinity of the ponded water within the claypans and the recorded depth to groundwater below the claypans indicates that the water is sourced from surface water runoff (refer Executive Summary of AQ2 2025). Similarly, the depth to groundwater in the vicinity of the persistent pools, indicate they are surface water fed (refer Section 6.4 of the Baseline Report (AQ2 2025)).

Comparing the observed water level recession in the claypans from recent rainfall events to evaporation data indicates that evaporation plays the primary role in removing collected water from the claypans, with only minor seepage to the groundwater system (refer Executive Summary of AQ2 2025). The rate of seepage from the claypans is limited by the low permeability of the clay that lines the claypans.

As documented in the impact assessment report (Section 6 of AQ2, 2024), the vegetation, and surface water features are not predicted to be impacted by groundwater level drawdown resulting from the proposed mining operations. The potential impacts to stygofauna are documented separately.

Figure 5.16 in the Impact Assessment report presents the predicted maximum extent of groundwater for the life of mine, with the southernmost environmentally sensitive area (ESA) covering the Karijini National Park. The predicted groundwater level changes have been plotted with respect to the closest gorges of the Karijini National Park in Figure 4.1 below. These figures show that no measurable groundwater level reduction is predicted in the national park.

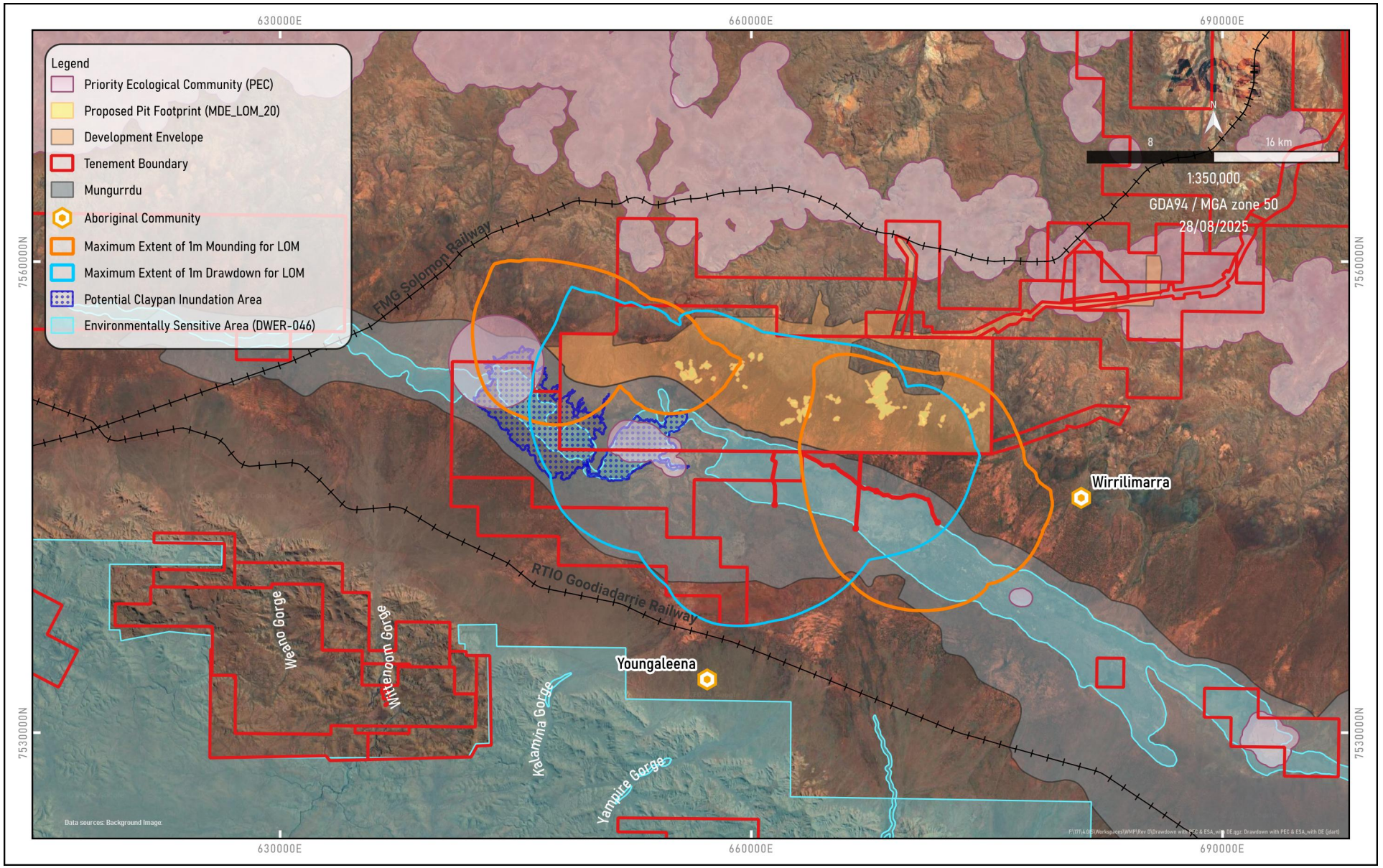


Figure 4.1 Predicted Extent of Drawdown and Mounding with respect to Environmentally Sensitive Areas in the Mulga Area

# 5. SUBMISSION COMMENT 16

## 5.1 Comment

*"The proponent has not conducted sufficient groundwater modelling, particularly on the expected impacts post-closure.*

*Long-term modelling of changes to salinity should be conducted to understand the risk to groundwater quality over time. Figures should also be provided to visualise the predicted changes."*

## 5.2 Response

The figures and report sections referred to in this response are provided in Attachment 5 of this document.

As documented in Section 5.5.7 of Impact Assessment (AQ2 2024), HanRoy intend to backfill the pits to above the pre-mining groundwater level at the completion of mining. This eliminates any post-mining increases in groundwater salinity caused by evaporation from the pit lake surfaces. Although the modelling of post-mining groundwater quality has not been conducted, with no on-going dewatering and MAR, the pre-mining groundwater processes will re-establish. For example, fresh water from rainfall will recharge the system and the regional and pre-mining groundwater flow direction will return (the latter being indicated by closure model predictions). As such, any changes to the groundwater salinity distribution over the pit and MAR areas is anticipated to also return to pre-mining conditions. However, the return of the salinity distribution to pre-mining conditions will take considerably longer to achieve than the recovery of groundwater levels.

We also refer to our response to BNTAC Comment 68 (AQ2 Doc Ref: 171X_557b, dated 27th June 2025) which provides additional detail and figures relating to the predicted groundwater salinity changes during the proposed mining operations.

Should you require any further information, please do not hesitate to contact us.

Regards,

*Mark Nicholls* — Consulting Water Resource Engineer

*Emma Bolton* — Consulting Hydrogeologist

Author: MAN / EJB (11/8/25)
Checked: DGS (12/8/25)
Reviewed: DGS (12/8/25)

Attachments:

1 Supporting Document Extracts for Response 3
2 Supporting Document Extracts for Response 16
3 Supporting Document Extracts for Response 17
4 Supporting Document Extracts for Submission Response 15
5 Supporting Document Extracts for Submission Response 16

## References:

AQ2 2024. *Mulga Downs Groundwater, Surface Water and Ecohydrological Impact Assessment.* Report prepared for HanRoy Iron Ore Pty, issued December 2024. AQ2 document reference 171X_493c.

AQ2 2025. *Mulga Downs Groundwater, Surface Water and Ecohydrological Studies – Baseline Assessment*. Report prepared for HanRoy Iron Ore Pty, issued March 2025. AQ2 document reference 171X_492d.

Hancock Prospecting 2025. *Water Management Plan: Mulga Downs Iron Ore Mine – Western Australia*. Report prepared by HanRoy / JBS&G and issued 10 April 2025. Document Reference MDM-85000-EN-PLN-0006 Rev A7.

ATTACHMENT 1
SUPPORTING DOCUMENT EXTRACTS FOR RESPONSE 3

## 7.5 Land Systems

Land system mapping units developed by the Department of Agriculture and classified on the basis of landform, geology, geomorphology, soils and vegetation provide useful functional information about landscape elements (Van Vreeswyk et al. 2004). Land systems intersecting the 2024 AOI are shown in Figure 7.4. Key ecohydrological attributes of the major land systems are further described in Table 7.1.

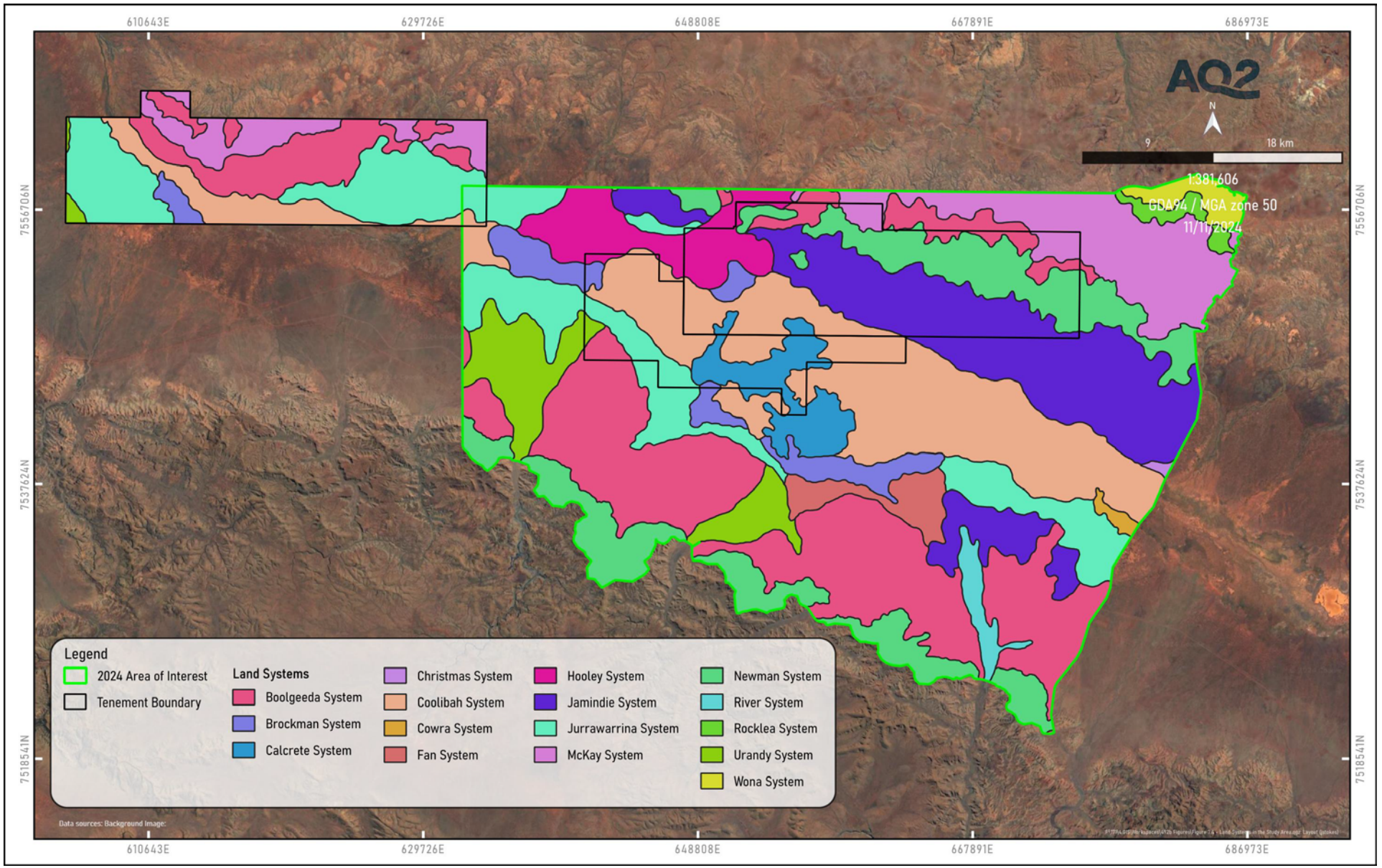


Figure 7.4 Land Systems in the Study Area and Surrounds

Table 7.1 Major Land Systems in the Study Area and Surrounds and their Ecohydrological Characteristics[2]

| Land system and extent in Project area | Description | Geomorphology and soils | Key ecohydrology characteristics |
|---|---|---|---|
| Uplands of the Chichester Range | | | |
| Newman – comprises most of the Chichester Range uplands in the Mulga East area | Rugged jaspilite plateaux, ridges and mountains supporting hard spinifex grasslands. Widespread across the Pilbara region. | Erosional surfaces, characterised by skeletal soils (with abundant pebbles, cobbles and stones) and frequent rock outcropping. Soils are shallow and stony. | Provides catchment water supply to the Fortescue Valley wetlands. Dendritic drainage pattern (numerus small catchments).<br>Xerophytic (drought tolerant) grass dominated vegetation predominantly rain fed. |
| McKay - comprises the Chichester Range uplands in the Mulga West area. | Hills, ridges, plateaux remnants and breakaways of meta sedimentary and sedimentary rocks supporting hard spinifex grasslands. | Erosional surfaces; hill tracts, ridges, plateaux remnants and breakaways with steep upper slopes and more gently inclined lower footslopes, restricted stony plains and interfluves. Soils are shallow and stony. | Provides catchment water supply to the Fortescue Valley wetlands. Moderately spaced tributary drainage patterns incised in narrow valleys in upper parts becoming broader and more widely spaced downstream.<br>Xerophytic (drought tolerant) grass dominated vegetation predominantly rain fed. |
| Boolgeeda – flanking areas of the Newman uplands | Stony lower slopes and plains below hill systems, supporting hard and soft Spinifex grasslands and less frequently Mulga shrublands. Widespread across the Pilbara region | Quaternary colluvium parent materials. Closely spaced dendritic and sub-parallel drainage lines. Predominantly depositional surfaces characterised by red loamy soils of shallow to moderate depth. | Minimal contribution to the catchments of the Fortescue Valley wetlands.<br>Xerophytic (drought tolerant) vegetation. Living plant cover typically less than 60%; with denser bands associated with drainage lines. Typically <50 mature trees and tall shrubs per hectare. |
| Wona – comprises a small area in the Chichester Range uplands in the northeast of the 2024 AOI | Extends to the northeast within the Chichester Range. | Level to very gently inclined basaltic plains. Soils mostly comprise self-mulching cracking clays and some deep red-brown non-cracking clay with stony mantles. | Minimal contribution to the catchments of the Fortescue Valley wetlands, mainly local infiltration.<br>Tussock grassland communities predominantly rain fed. |

[2] Adapted from Van Vreeswyk et al. (2004).

| Land system and extent in Project area | Description | Geomorphology and soils | Key ecohydrology characteristics |
|---|---|---|---|
| Alluvial plains | | | |
| Jamindie - comprises the majority of the alluvial plain at the base of the Chichester Range in the Mulga East tenement | Stony hardpan plains and rises supporting groved Mulga shrublands, occasionally with spinifex understorey. | Depositional surfaces including non-saline plains with hardpan at shallow depth, stony upper plains and low rises on hardpan or rock. Minor stony gilgai plains, sandy banks and low rises and hills. Shallow loamy soils (often stony/gravelly) are predominant. | Widely spaced tributary drainage tracts and channels, dissecting and separated by relictual alluvial fans. These support extensive banded vegetation formations sustained by localised surface water distribution (sheet flow). This catchment format controls the delivery of flows to the Fortescue Valley, contributing to heterogeneity in the wetland complex. |
| Hooley – comprises the alluvial plain in the far west of the Mulga east tenement. | Alluvial clay plains supporting a mosaic of snakewood shrublands and tussock grasslands. | Depositional surfaces including level plains of clayey and stony alluvium as a mosaic of surfaces with gilgai microrelief. Soils are mainly deep red/brown non-cracking clays and self-mulching cracking clays. | Mostly sluggish internal drainage, however several drainage tracts with well-defined channels convey flows into Brockman Land system and Fortescue Valley wetlands downstream. Vegetation is sustained by deep soils with relatively large vadose storage. |
| Brockman – occurs in a zone between the Hooley and Coolibah land systems in the Mulga East tenement; and between the Jurrawarrina and Coolibah land systems in the Mulga West tenement. | Alluvial plains with cracking clay soils supporting tussock grasslands.<br>Note: In the Hamersley Range, this land system may support a rare tussock grassland dominated by *Astrebla lappacea* constituting a Priority Ecological Community (P1) (DBCA 2022). | Depositional surfaces derived from Quaternary alluvium. Non-saline alluvial plains with clay soils and gilgai micro-relief, flanked by slightly more elevated hardpan washplains. Soils are mainly self-mulching cracking clays and red/brown non-cracking clays, with some red loamy earths on elevated washplains. | Appears to occur at the break of slope in an area of fine textured, outwashed sediment accumulation. Sluggish internal drainage with occasional channel; however in the Mulga East tenement this unit is also crossed by a major channel feeding into the Fortescue Valley wetlands.<br>Vegetation is sustained by deep soils with relatively large vadose storage. |
| Jurrawarrina - comprises the southern alluvial plain bordering the Fortescue Valley wetlands in Malay Well tenement.<br>The major unit bordering the Fortescue Valley wetlands in the Mulga West tenement. | Hardpan plains and alluvial tracts supporting Mulga shrublands and tussock and spinifex grasslands. | Depositional surfaces derived from Quaternary alluvium and colluvium. Plains receiving overland sheetflow characterised by banded Mulga vegetation; and broad drainage tracts with or without defined channels. Soils are a mixture of red/brown clays, loams, earths and duplex types. | Functionally similar to the Jamindie land system, but with less well-defined drainages and more patchy banded vegetation formations. |

| Land system and extent in Project area | Description | Geomorphology and soils | Key ecohydrology characteristics |
|---|---|---|---|
| Fortescue River valley/drainage tract | | | |
| Calcrete – prominent in the Malay Well tenement and contributes to the Fortescue Valley wetlands area. | Low calcrete platforms and plains supporting shrubby hard spinifex grasslands. | Tertiary calcrete formed in valley fill deposits, with minor Quaternary alluvium. Drainage is generally indistinct. Soils are mainly shallow calcareous loams (<50 cm overlying calcrete), with minor calcareous loamy earths and red shallow loams. | The vegetation mosaic is inter-dispersed by calcrete outcrops and small depressions. Includes some incised channel zones connecting claypans.<br>Vegetation water requirements include localised surface water distribution (e.g. shedding from outcrops). Major floods are likely to replenish deep soil water stores infrequently. Periods of prolonged waterlogging may occur.<br>Subsoil calcrete sheeting is likely to constitute a barrier to tree root penetration. |
| Coolibah – encompasses the majority of the Fortescue Valley wetlands area in the Mulga East, Malay Well and Mulga West tenements. | Coolibah – Flood plains with weakly gilgaied clay soils supporting Coolibah woodlands with tussock grass understorey. | Depositional surfaces including active flood plains with shallow, meandering and anastomosing drainages and extensive, largely bare claypans. The soil is typified by deep red/brown cracking and non-cracking clays. | Encompasses the Gnalka Gnoona and Koodjeepindarranna Claypans. Fringing woodlands include *Eucalyptus victrix* and *Acacia distans;* also *Acacia stenophylla* is a notable species in eastern areas.<br>Soil water replenishment by surface water inflows is important for sustaining the woodland trees and grasses. Major floods are likely to replenish deep soil water stores infrequently. Includes areas subject to periods of prolonged waterlogging.<br>Contains Environmentally Sensitive Area (ESAs), including the Freshwater Claypans of the Fortescue Valley PEC (DBCA 2022). |

# 8. DELINEATION OF ECOHYDROLOGICAL UNITS

## 8.1 Overview

The findings of the knowledge review, site inspection and remote sensing data (Section 7) underpinned the identification of ten landscape ecohydrological units (EHUs), which are summarised in Table 8.1.

The spatial distribution of these EHUs was delineated from the on-ground observations (within the 2023 AOI) augmented by interpretation of topography, geology mapping, aerial photography and Sentinel-2 remote sensing imagery (Figure 8.1). It is noted ground-truthing was not undertaken for the delineation of the EHUs over the extended 2024 AOI.

Conceptual models were developed that describe the key elements and functional aspects of each EHU, which are further described in Section 8.2 (Chichester Range Uplands), Section 8.3 (Alluvial Fans) and Section 8.4 (Fortescue Valley Flats).

Table 8.1 Summary of Landscape Ecohydrological Units in the Area of Interest (AOI)

| | EHU | Summary description | Hydrological behaviour |
|---|---|---|---|
| Chichester Range Uplands | Upland Rises | Peaks and upper hillslopes; shallow or skeletal soils overlying basement rocks. | Runoff source areas – shed water to downgradient landscape units. |
| | Upland Valleys | Broader depressions in the Chichester Range where sediments have accumulated, facilitating runoff capture/storage and denser vegetation. | Local sink area, receiving diffuse flow from Upland Rises Surplus from overtopping delivered into Upland Drainages. |
| | Upland Drainages | Single thread channels with cobble beds that traverse and exit the Chichester Range. Unconfined to semiconfined by hills of basement rocks. Channel beds mostly unvegetated with regular gravel bars and scour pockets. Scattered *E. victrix* trees in deeper soil pockets fringe the channels. | Transfer zones, receive runoff from upland catchments and transmit into Alluvial Fan Drainages. |
| | Basaltic Tablelands | Level to very gently inclined basaltic plains. Soils mostly comprise self-mulching cracking clays supporting tussock grassland communities. | Local sink area, receiving direct rainfall or locally distributed runoff |
| Alluvial Fans | Alluvial Fan Washplains | Banded vegetation (mulga and Snakewood) on a gently sloping stony plain. Runoff is generated in intergrove areas and mostly captured in the adjacent downslope grove. | Local sink area receiving rainfall. Surplus from overtopping delivered into Alluvial Fan Drainages. |
| | Alluvial Fan Drainages | Low sinuosity channels with narrow floodplains, collectively constituting drainage tracts, which dissect the Alluvial Fan Washplains. Supports relatively dense mulga shrubland. | Transfer zones, receive runoff from Upland Drainages and transmit into the Fortescue Valley. |
| Fortescue Valley Flats | Valley Calcrete Plains | Expansive unit of the Fortescue Valley. Variably dissected and overprinted by alluvium, giving rise to a subtle mosaic of benches, rises and depressions. Vegetation type and density related to soil depth, which is constrained by shallow calcrete (generally within 50 cm of the surface). | Benches and rises function as runoff source areas once internal storage is exceeded, shedding water to immediately adjacent units. |
| | Valley Stony Flats | Stony flats in the Fortescue Valley, generally on the valley margins where slope (and hence runoff) is insufficient to support banded vegetation. Prone to accumulation of salts due to poor infiltration; only sparsely vegetated. These areas support transient but not persistent ponding. | Receive inflows from Alluvial Fan Drainages. The flat stony pavement surfaces function as runoff source areas once internal storage is exceeded, shedding water to immediately adjacent units. |

| | EHU | Summary description | Hydrological behaviour |
|---|---|---|---|
| | Valley Loamy Flats | Broad flats typically inset from the valley margins, where accumulated sediment and organic matter create better soil structure and high infiltration rates. Relatively deep soils (may exceed 100 cm). High surface roughness contributes to some localised surface water redistribution within the unit.<br>These areas support dense patches of woodland and grassland vegetation; with vegetation types related to subtle changes in physical and chemical soil properties. | Predominantly sink areas that receive runoff from adjacent units (Valley Stony Flats and Calcrete Plains). Overtopping is uncommon and associated with large cyclonic rainfall events. |
| | Valley Ponding Flats | The lowest depressions in the Fortescue Valley where water ponds; typified by high clay content topsoil that impedes infiltration. Prone to accumulation of salts due to poor infiltration; only sparsely vegetated. These areas support persistent ponding. | Sink areas that collect rainfall and receive runoff from adjacent units (Valley Stony Flats and Calcrete Plains, and more rarely Loamy Flats). |

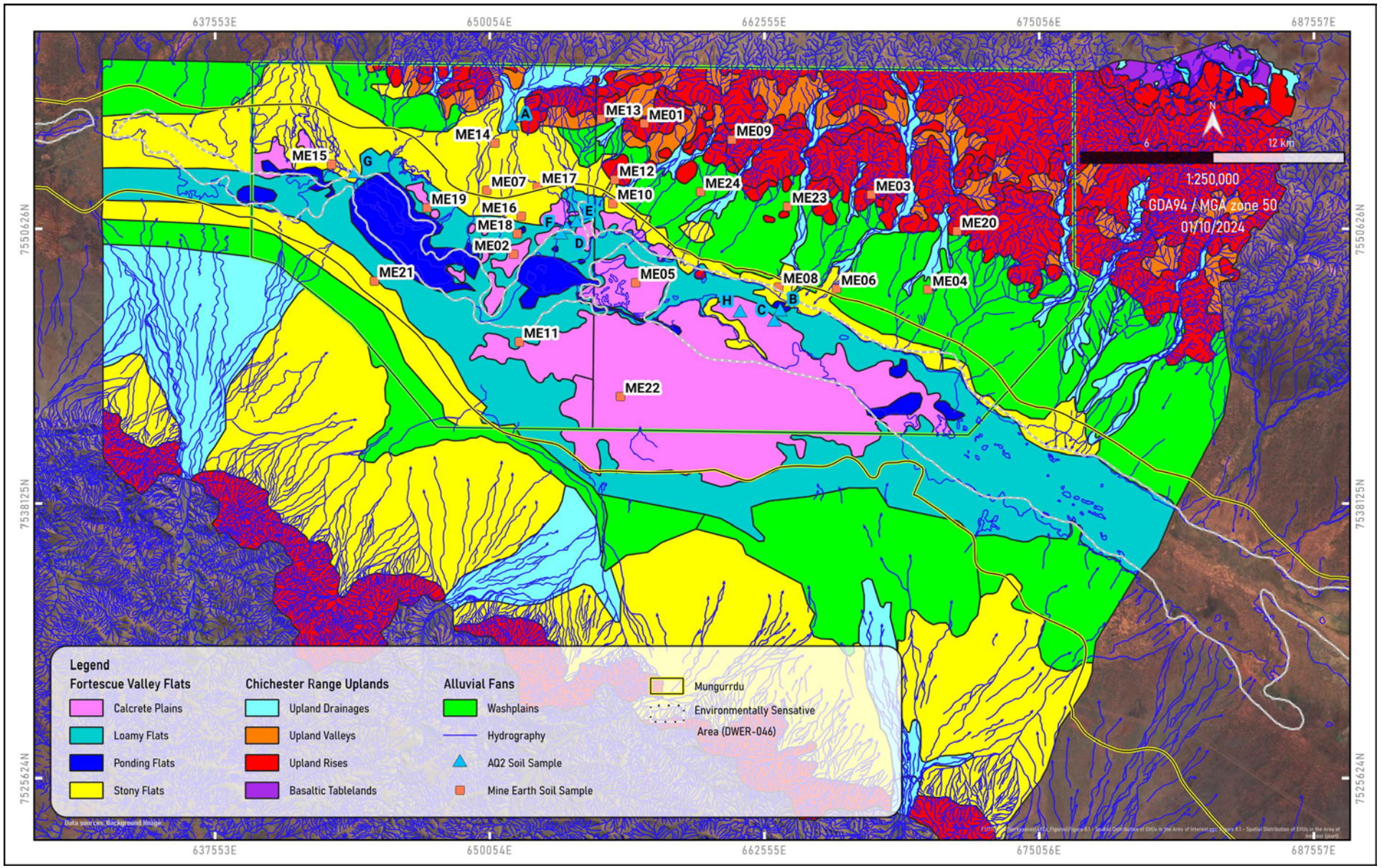


Figure 8.1 Spatial Distribution of EHUs in the Area of Interest

## 8.2 Chichester Range Uplands

### 8.2.1 Landscape Context

The uplands of the Chichester Range include the following landscape ecohydrological units:

- Upland rises.
- Upland valleys.
- Upland drainages.
- Basaltic tablelands.

The conceptual ecohydrological model for these units is schematically depicted in Figure 8.2.

### 8.2.2 Elements

Key elements of the Chichester Range Uplands ecohydrological units are described as follows:

- Upland rises:
  - Land surface – gently to steeply inclined rocky crests and ridges.
  - Regolith – shallow or skeletal soils with frequent bedrock exposures.
  - Groundwater – the regional groundwater system, hosted in basement rocks, is deep and inaccessible to vegetation.
  - Keystone vegetation – dominated by spinifex grasses (*Triodia* spp.), with scattered trees (*Eucalyptus leucophloia* subsp. *leucophloia* +/- *Corymbia hamersleyana*) and shrubs (*Acacia* spp.). These are generally regarded as shallow rooted, highly drought tolerant species. Higher density vegetation patches are associated with greater soil depth.
- Upland valleys:
  - Land surface – open depressions between crests and ridges, typically up to several hundred meters wide and with a flat to gently undulating base near the base of the Chichester Range.
  - Regolith – soils of variable depth and texture derived from colluvium and alluvium, often with significant gravel content.
  - Groundwater – the regional groundwater system, hosted in basement rocks, is deep and inaccessible to vegetation.
  - Keystone vegetation – mixed Acacia spp. shrubland, with sparse/patchy tussock grass (*Themeda triandra*) and scattered trees (*Eucalyptus victrix* +/- *Corymbia hamersleyana*). Higher density vegetation patches are associated with greater soil depth.
- Upland drainages:
  - Land surface – single thread, unconfined to semiconfined channels with a cobble base that dissect the Upland valleys, with indistinct floodplains. Sometimes with poorly defined flood runners infrequently activated by larger events.
  - Regolith – channels cut into the valley colluvium, alluvium. Depth of incision mediated by gravel bed and ultimately constrained by consolidated regolith materials.
  - Groundwater – the regional groundwater system is deep and inaccessible to vegetation. Some transient perching of water under the channel sediments may occur in niche locations such as clay lined scour pockets.
  - Keystone vegetation – the banks of the channels are typically lined with well-spaced (sparse) Eucalyptus victrix trees and Acacia shrubs.
- Basaltic Tablelands:
  - Land surface – level to very gently inclined basaltic plains up to 4 km in extent, commonly with gilgai microrelief.

- Regolith – the in situ formed soils are predominantly fine textured, mostly comprising self-mulching cracking clays and some deep red-brown non-cracking clay with mantles of basaltic pebbles and cobbles (up to boulders).
- Groundwater – the regional groundwater system, hosted in basement rocks, is deep and inaccessible to vegetation.
- Keystone vegetation – the basaltic tablelands support tussock grassland communities, with major taxa including *Eragrostis xerophila* (Roebourne Plains grass), *Aristida latifolia* (Feathertop threeawn) and *Astrebla pectinate* (Barley Mitchell grass), with patches of *Triodia spp.* and sparse mixed shrubs. The basaltic tablelands are associated with the Wona land system, which contains four priority listed ecological communities (DBCA, 2023) and the Priority 3 species *Glycine falcata*.

### 8.2.3 Processes

Key processes within and across Chichester Range Uplands ecohydrological units are described as follows:

- Upland rises:
  - Soil water replenishment/loss – infiltration of direct rainfall. High evaporation losses. Soil water storage rapidly depleted by vegetation.
  - Surface drainage - significant runoff losses. Generally short distance overland/diffuse flow into dendritic drainage networks (1st order flow lines). Rapid shedding of storage excess.
  - Groundwater recharge – minimal recharge owing to restricted infiltration/low permeability basement above the water table.
  - Vegetation water use – plants exhibit a pulse/dormancy dynamic linked to rainfall events, and are exposed to a high degree of drought stress.
- Upland valleys:
  - Soil water replenishment/loss – infiltration of direct rainfall augmented by delivered runoff. Soil water storage rapidly depleted by vegetation.
  - Surface drainage - surface accumulation and infiltration of flood flows (overland flows and channel breakouts). Excess volumes transferred to adjacent channels (Upland drainages unit).
  - Groundwater recharge - minimal recharge as water inputs are predominantly stored in the soil profile and depleted by vegetation.
  - Vegetation water use – plants exhibit a pulse/dormancy dynamic linked to soil moisture dynamics. Seasonal exposure to drought stress in the Pilbara dry season.
- Upland drainages:
  - Soil water replenishment/loss – principally associated with flow events.
  - Surface drainage – receive, aggregate and transmit rapidly delivered runoff pulses as high energy flows. Bed load movement restricts vegetation establishment within the channels. Banks rarely overtop into surrounding valley. Gravel banks and bars contribute to surface roughness in the channels.
  - Groundwater recharge – transient, focussed recharge in the channels may be associated with flow events. However, the majority of inflows are transmitted downstream.
  - Vegetation water use – the vegetation exhibits a pulse/dormancy dynamic linked to soil moisture dynamics. Exposed to seasonal drought stress in the Pilbara dry season.
- Basaltic Tablelands:
  - Soil water replenishment/loss – infiltration of direct rainfall or locally distributed runoff. In the case of cracking clays, desiccation cracks may facilitate preferred pathway infiltration via deep percolation paths.

- Surface drainage – minimal lateral redistribution of rainfall due to low surface gradients, grassy vegetation and infiltration.
- Groundwater recharge – minimal owing to low permeability of fine textured soils and vadose water uptake by vegetation.
- Vegetation water use - the vegetation exhibits a pulse/dormancy dynamic linked to soil moisture dynamics. Exposed to seasonal drought stress in the Pilbara dry season.

### 8.2.4 Data Gaps/Uncertainties

Data gaps and uncertainties relating to the ecohydrology of Chichester Range Uplands ecohydrological units include:

- Quantification of rainfall/runoff relationships and associated streamflow behaviour. Surface water loggers installed by AQ2 in 2018 in some of the channels are starting to provide relevant data.
- The depth and soil water holding capacity of upland soils is inferred but has not been measured to date.
- Vegetation water use dynamics as related to soil moisture status.

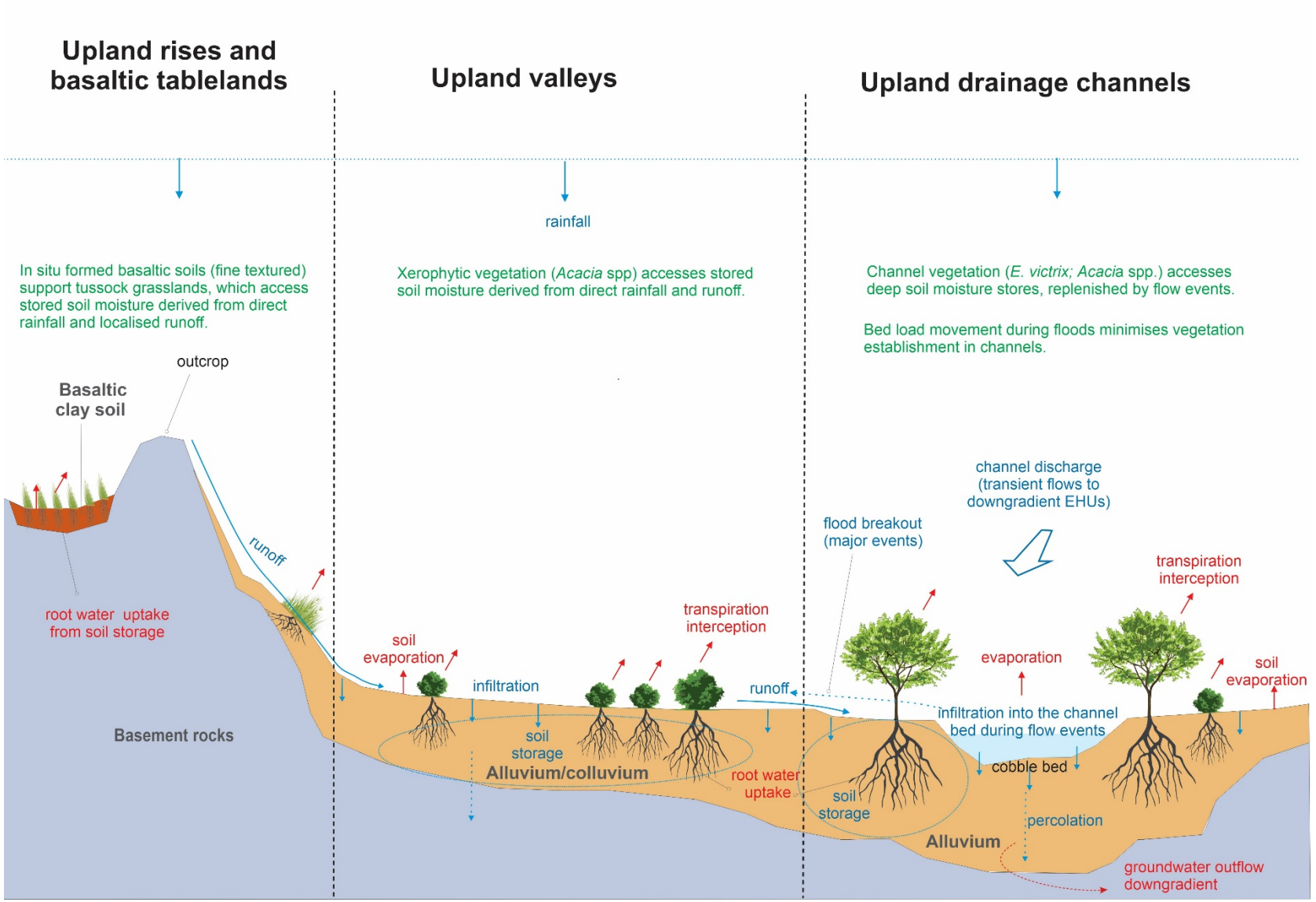


Figure 8.2 Ecohydrological Conceptualisation of the Chichester Range Uplands

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### 7.3.7.2 Surface Water Hydrology and Ecohydrology

The following provides a list of potential environmental receptors, relevant to surface water hydrology and ecohydrology, identified within and near the Development Envelope. Their locations are illustrated in **Figure 7-29** (AQ2 2024a).

- The area known as the Fortescue Marshe has been demarcated in the Directory of Important Wetlands in Australia (Environment Australia 2001) as DIWA WA066. This area includes the Fortescue Marsh upstream of Goodiadarrie Hills and includes the section of the Fortescue Valley downgradient of the Development Envelope containing Goodiadarrie Swamp, the claypans and floodplains which is registered as Environmentally Sensitive Area DWER-046 (AQ2 2025).
- Koodjeepindarranna and Gnalka Gnoona claypans and surrounding *E. victrix* dominated woodland. These claypans are part of the 'Freshwater claypans of the Fortescue Valley' (Priority 1) Priority Ecological Community (PEC) (AQ2 2025) in the Goodiadarrie Swamp system. These claypans are outside the Development Envelope. When flooded, the claypans are known to provide habitat for waterbirds including migratory species. Across the greater Fortescue Valley, larger claypans and river pools tend to support greater numbers and diversity of waterbirds than smaller shallower wetlands (Pinder et al. 2017).
- The Ebathcalby claypan is a Priority 1 PEC located about 9 km south (and to the east) of the eastern margin of R47/12. The Ebathcalby Claypan is unlikely to be impacted by runoff from the Proposal, as its elevation is approximately 5 m higher than the base of the Fortescue Valley below the Development Envelope.
- Millstream National Park is located more than 100 km west of the Development Envelope, further down the Fortescue Valley. During very large and infrequent cyclonic events, the Koodjeepindarranna Claypan may overtop and contribute to downstream flow into the Lower Fortescue River system towards Millstream.
- Surface water flows from Karijini National Park are towards the Fortescue River, on the opposite side of the Fortescue Valley to the proposal, so there is no mechanism or pathway for modified surface waters as a result of the Proposal to impact the National Park.
- The 'Four plant assemblages of the Wona Land System' Priority 1 PEC is a system of basalt upland gilgai plains comprising vegetation types MTGW and ASL (2) (Priority 1 – Priority 3)
- with grassland vegetation assemblages. The PEC occurs north of the Goodiadarrie Swamp sub-catchment divide and is therefore ecohydrologically disconnected from the proposed pit areas, however, the proposed haul road crosses through the PEC.
- Several small, surface water fed channel pools that hold water for a period of time following runoff events, in the Fortescue Valley, south of the Development Envelope occur. These pools are considered to have potential local conservation significance. They are within the Goodiadarrie Swamp and within drainage channels reporting to the valley floor, and persist, following runoff events. These pools include (but are not limited to):
  - Channel pool within the Koodjeepindarranna Claypan complex (Pinder et al. 2010).
  - Channel pool at UTM Zone 50 653300E and 7550400N. Identified from aerial photography.
  - Channel pool at UTM Zone 50 661600E and 7547770N. Identified from aerial photography.

- Gidyea pool south and east of the Development Envelope, near the Ebathcalby Claypan – has significant wetland floor vegetation in contrast with claypans further to the west (Pinder et al. 2017). As discussed above, this pool is not located downstream of the Development Envelope.

The proposed mine pit footprints will avoid the boundary of the ESA area with a buffer of 200 m.

*Acacia stenophylla* is a notable overstorey tree species in the Fortescue Valley floodplain woodlands to the south of the Development Envelope (AQ2 2025). This species is widespread in inland eastern Australia, with the Fortescue Valley population constituting a major outlier from its core distribution (AQ2 2025).

#### 7.3.7.3 Subterranean Fauna

The Development Envelope and surrounding area host a particularly diverse range of subterranean fauna, including stygofauna and troglofauna (BEC 2019; 2021; 2024).

On the basis of geological logging, core photos and subterranean fauna survey results, lithological units have been grouped based on the potential to support a troglofauna or stygofauna habitat. The geological units identified as likely habitats for troglofauna and stygofauna are the Upper Calcrete and CID/Pisolite of the Tertiary sequence and Mineralised Marra Mamba (refer to AQ2 2024a **Appendix 9**). For troglofauna, these potenital habitat units are restricted to where they occur above the water table. For stygofauna (occurring in the groundwater):

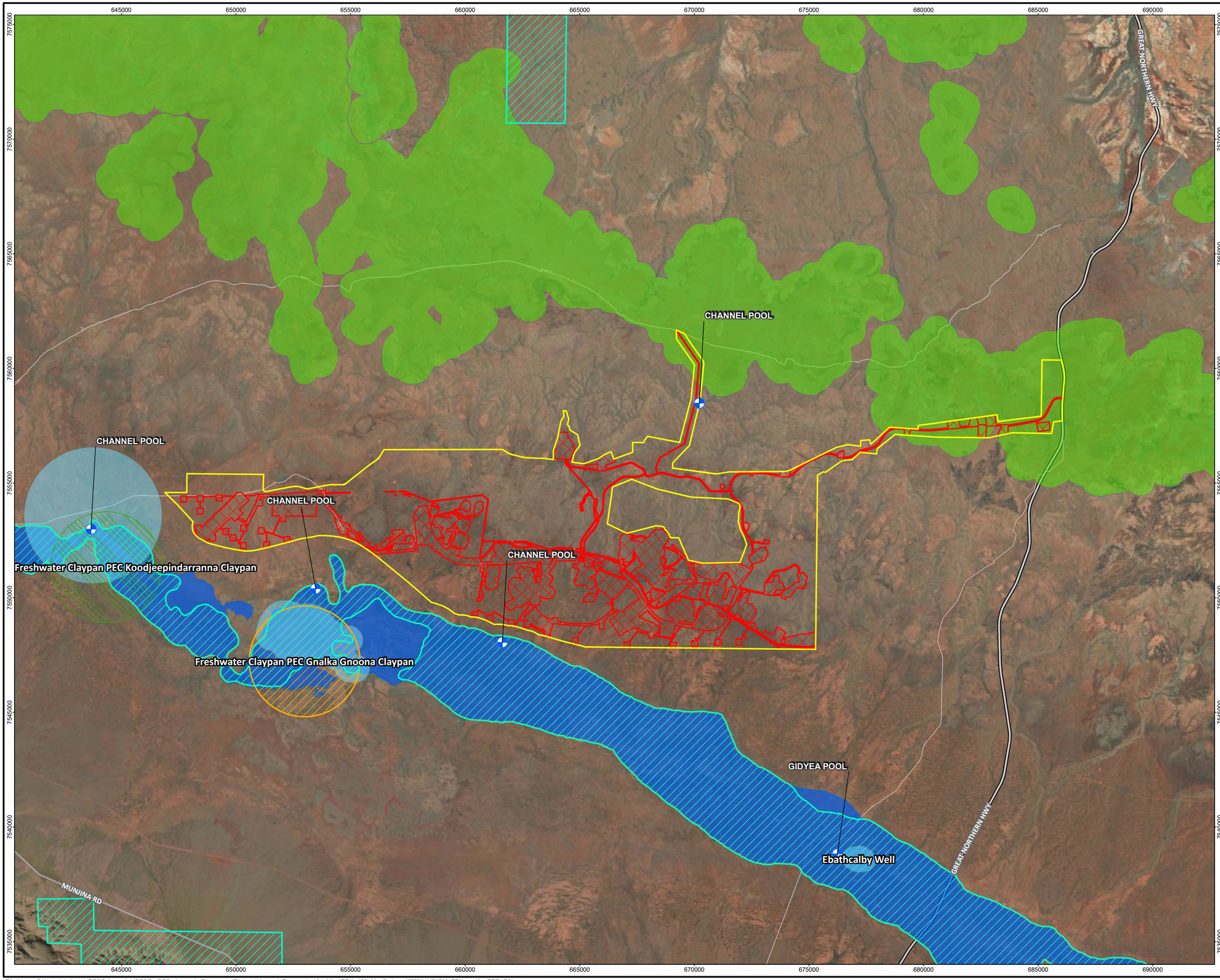
- The likely Upper Calcrete habitat is a continuous unit that occurs to the south of the proposed mining area and extends both across the Fortescue Valley and along the strike of the valley.
- The likely habitats of Mineralised Marra Mamba and CID / Pisolite extend over much of the Chichester Range, with the CID / Pisolite occurring as a continuous unit, extending to the south across the valley and the Mineralised Marra Mamba occurring as discontinuous pods associated with the mineralisation.

These habitats are described in **Section 8** of this document. Refer to **Appendix 9** for 3D habitat assessment by AQ2.

### 7.3.8 Other Potential Users

Aside from the natural environment, existing groundwater users within and surrounding the Development Envelope include the local and nearby stations (Mulga Downs, Hooley and Mt Florance Stations), for stock watering. Additional, more regional, groundwater users are the Wirrilimarra and Youngaleena Communities and licenced water supplies associated with the operation of the existing FMG (Solomon) railway and Goodiadarrie transport corridor.

Figure 7-29: Location of Potential Environmental Receptors and other Potential Users




**Legend**

- Development Envelope
- Indicative Footprint

Priority Ecological Communities (DBCA-038)

- Freshwater claypans of the Fortescue Valley PEC buffer (P1)
- Four plant assemblages of the Wona Land System PEC buffer (P1)

Ecohydrology Focus Area (AQ2)

- Focus Area A: Gnalka Gnoona claypan and surround E.victrix woodland
- Focus Area B: The Koodjeepindarranna claypan and surrounding E.victrix woodland
- DIWA Wetland Boundary 066 (Fortescue Marshes) [not the Fortescue Marsh]
- Environmental Sensitive Areas (DWER-046
- Surface Water Channel Pool

Roads (LGATE-195)

- Highway
- Major road
- Minor Road

JBS&G

Job No: 67751

Client: Hancock Prospecting Pty Ltd

| Version: A | Date: 17-Dec-2024 |
|---|---|
| Drawn By: droberts | Checked By: VC |

Scale 1:150,000 at A3

0 2 4
Kilometers

Coord. Sys. GDA2020 MGA Zone 50

**Mulga Downs Iron Ore Mine**
**Central Pilbara, Western Australia**

**LOCATION OF POTENTIAL ENVIRONMENTAL RECEPTORS AND POTENTIAL USERS**

**FIGURE 7.29**

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Image Reference: World Imagery: Earthstar Geographics www.nearmap.com© - Imagery Date: 28. May 2022.

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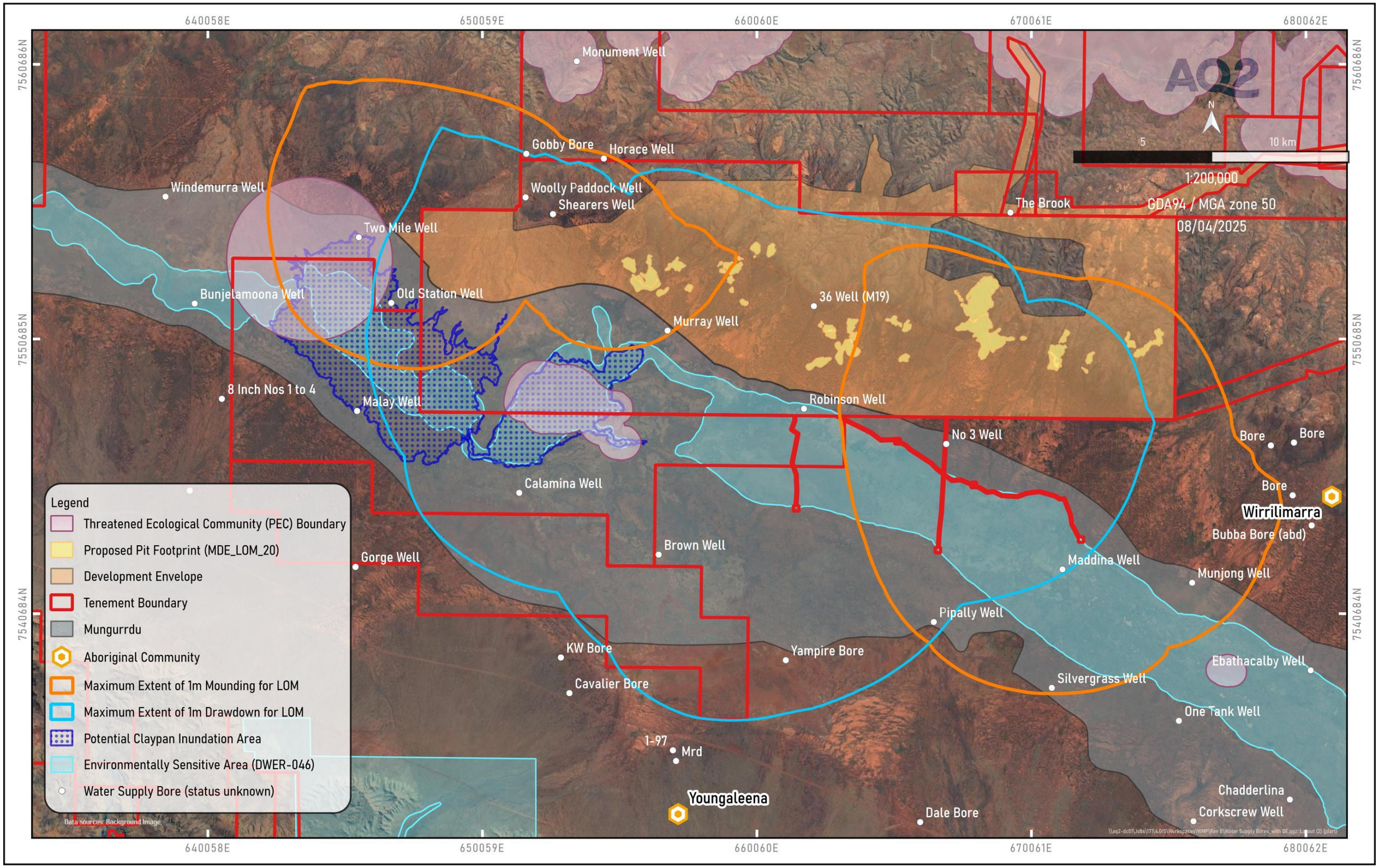



**Figure 1-4: Water Supply Bores**

Table 1.1 Regional Stratigraphic Sequence within the Study Area

| Group | Formation | Member | Lithological Description |
|---|---|---|---|
| Recent Alluvium / Colluvium | | | Unconsolidated silt, sand and gravel (clay near pans) |
| Tertiary Detritals (TD) | TD3 | | Red haematitic scree on valley sides. Increasing silt / clay content with distance from slopes / fans<br>Increasing pisolitic content with depth |
| | TD2 | | Silcrete, calcrete (Oakover Formation), Channel Iron Deposit (CID), mottled clay |
| ?* | ?* | Pinjan Chert | Siliceous sediment with alternating laminated chert |
| Hamersley Group | Wittenoom Formation | Bee Gorge Member | Graphitic shale with minor sequences of carbonate, chert, volcaniclastic rock and Banded Iron Formation (BIF) |
| | | Paraburdoo Member | Dolomite with minor amounts of chert and shale |
| | | West Angela Member | Dolomite, dolomitic / manganese-rich shale, BIF and chert |
| | Marra Mamba Iron Formation | Mt Newman Member | BIF with minor shale |
| | | MacLeod Member | Shale, chert and BIF |
| | | Nammuldi Member | BIF, chert and shale |
| Fortescue Group | Jeerinah Formation | Roy Hill Shale Member | Dark grey to black graphitic shale with chert; locally pyritic |
| | | Warrie Member | Grey dolomite with inter-bedded chert (locally ferruginous), shale and mudstone |

*Age of the Pinjan Chert is uncertain

## 1.8 Native Title and Cultural Significance

The area covered by the water and ecohydrological studies is subject to two Native Title determinations (refer Figure 1.4) The Mulga East and Malay Well tenements fall within the native title area of the Banjima People, whilst the Mulga West tenement straddles the boundary of the Banjima People and Yindjibarndi People Native Title areas.

Mungurrdu (refer Figure 1.4) is a DPLH Aboriginal Cultural Heritage Lodged Place (ID:40484). The Banjima People are the Knowledge Holders for this place, it is culturally significant in multiple ways including as; a ritual and ceremonial area, a meeting place, a hunting place, a water source, and is associated with Creation/Dreaming stories. Banjima representatives first indicated to HanRoy the area had significant heritage values during a heritage survey in July 2023 before it was formally lodged as Mungurrdu with the DPLH in March 2024.

## 1.9 Land Use & Existing Groundwater Users

The Study Area lies within the administrative boundary of the Shire of Ashburton. The Mulga East and Malay tenements are wholly contained within the Mulga Downs pastoral lease area; whilst the Mulga West tenement is predominantly within the Mount Florence pastoral lease area; except for the western portion (circa 55 $km^2$) that intersects the northwest portion of the Mulga Downs pastoral lease and northeast fringe (circa 8.5 $km^2$) that intersects the Hooley pastoral lease (refer Figure 1.4) There is a long history of pastoral land use in the area, predominantly cattle grazing.

Existing groundwater users in the Study Area include the local and nearby stations (Mulga Downs, Hooley and Mt Florance Stations), for stock watering as well as the Wirrilimurra and Youngaleena Communities (Figure 1.5) and licenced water supplies associated with the construction of the existing FMG (Solomon) railway and RTIO (Goodiadarrie) railway.

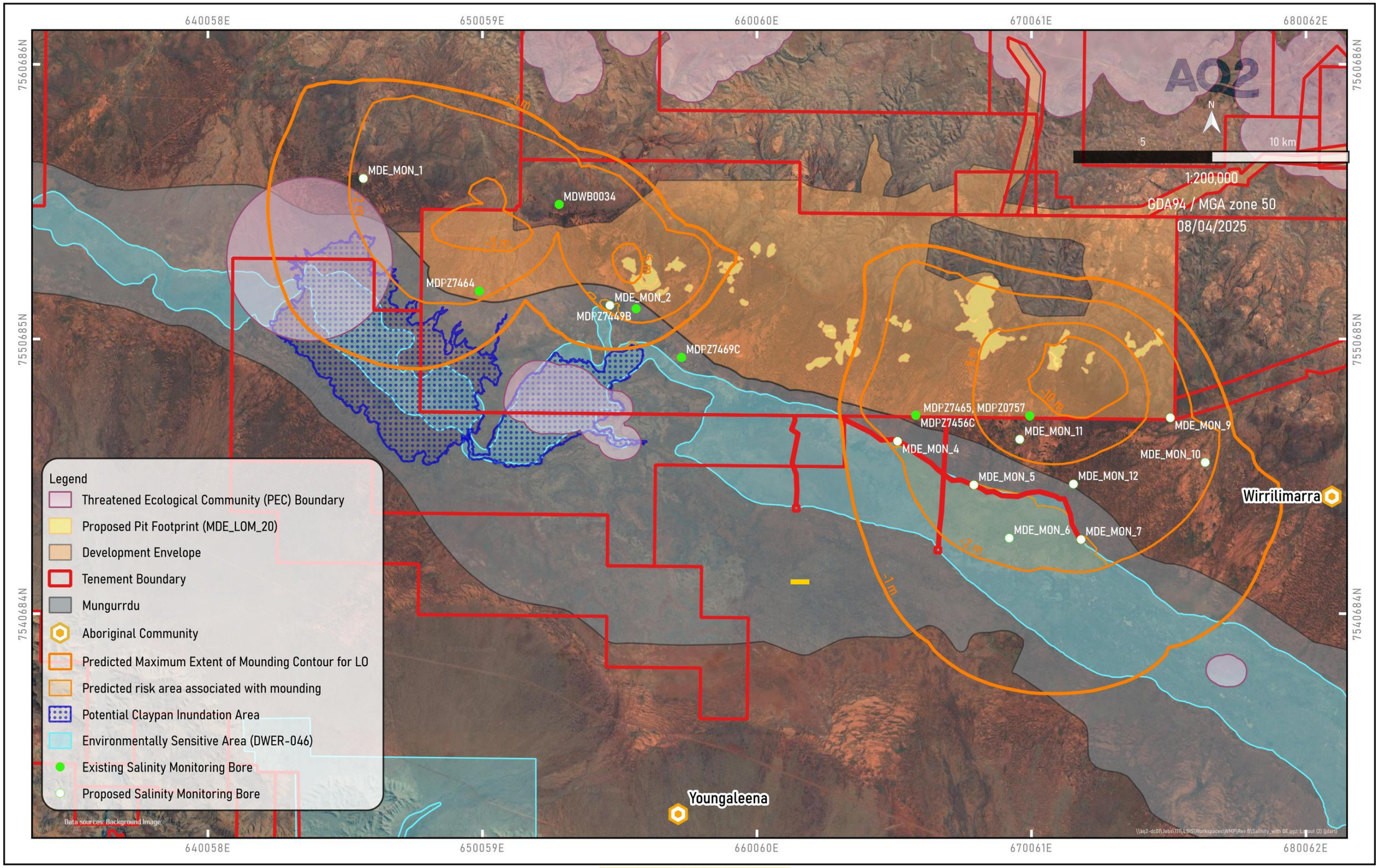



**Figure A3-4: Salinity Monitoring Bores**

**Table 2-2: Outcome -Based and Objective-Based Management Measures**

| Management Measure | Rationale | Applied Indicator | Management Objective |
|---|---|---|---|
| Outcome-Based Management Provisions | • Outcome-based provisions are performance-based and may be used where the part of the environment is capable of objective measurement and reporting.<br>• Outcome-based provisions have been developed where the level of impact is known and quantifiable, with the establishment of trigger and threshold criteria and appropriate exceedance responses | • Groundwater Quality<br>• Groundwater Levels<br>• Vegetation Health | • Minimise change to current beneficial use of groundwater<br>• Minimise the impact on other groundwater users including minimising the extent of groundwater level change<br>• Manage groundwater levels such that there is no surface expression of groundwater or water logging of vegetation that could impact vegetation health |
| Objective Based Provisions | • Objective-based management actions are applied when the level of impact is unknown or unable to be quantified.<br>• Objective-based management is used where specific trigger or threshold criteria may not be appropriate for the circumstances. This includes where insufficient information is known about the environmental system or where all or part of the environment is not capable of being measured against trigger or threshold criteria. | • Surface Water Quality<br>• Surface Water Quantity<br>• Vegetation Health | • Maintain the existing hydrological regime as much as is practicable<br>• Mitigate impacts on surface water regime within the Goodiadarrie Swamp and its catchment, in terms of both quality and quantity of water, to maintain vegetation health<br>• Mitigate impacts on surface water quality from erosion, sedimentation and pollution associated with construction and operations by containing clean water and impacted water, and treating impacted water on-site prior to release to the downstream environment<br>• Reduce the risk of surface water having a significant impact on mining operations |

## 2.4 Groundwater Level and Quality Trigger Levels

Trigger levels have been defined for water quality and groundwater levels. Provisional water quality trigger levels, provided in Table 2-3, have been developed based on statistical analysis of baseline data and in line with Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ, 2000; ANZG, 2018). The methodology applied and rationale, as well as response actions, are detailed in the CBEC (2024) assessment document, provided as **Appendix 1**. Additionally, predicted water quality change, specifically salinity (as total dissolved solids), due to dewatering and MAR has been considered in setting water quality triggers. The prediction of salinity change has been undertaken in conjunction with the simulation of dewatering and MAR and prediction of water level change. It should be noted however that the triggers for elemental concentrations (Table 2-3) are not based on predictions of change or amended to reflect change in line with predicted salinity

change. Future assessment of change to elemental concentrations will require consideration of predicted salinity change.

**Table 2-3: Provisional Groundwater Water Quality Trigger Values**

| Parameter (mg/L) | ANZG Default Guideline Value (DGV) 95% of Species Limit of Protection | Low Risk Trigger Value (LRTV) 80th percentile | Investigation Trigger Value ()ITV 90th percentile |
|---|---|---|---|
| pH | 6.5 – 8.5 | 7.1-8.0 | 7.0-8.0 |
| EC (µS/cm) | - | 8,000 | 15,000 |
| Alkalinity as $CaCO_3$ | - | 400 | 440 |
| *Ag | 0.00005 | (0.002)* | (0.0025)* |
| Al | 0.055 | 0.050 | 0.050 |
| As | 0.013 | 0.0025 | 0.0070 |
| B | 0.37 | 2.4 | 3.1 |
| Ba | - | 0.055 | 0.13 |
| Be | 0.00013§ | (0.001)* | (0.0025)* |
| Bi | 0.0007§ | (0.0025)* | (0.0025)* |
| Ca | - | 240 | 300 |
| *Cd | 0.0002 | (0.0001)* | (0.00025)* |
| Cl | - | 2,000 | 4,000 |
| Co | 0.0028 | 0.0010 | 0.0025 |
| Cr | 0.001 | 0.0080 | 0.0092 |
| *Cu | 0.0014 | (0.002)* | (0.0025)* |
| F | - | 2.0 | 3.3 |
| Fe | 0.3§ | 0.013 | 0.030 |
| $HCO_3$ | - | 440 | 480 |
| Hg | 0.0006 | 0.0005 | 0.0005 |
| K | - | 270 | 320 |
| Mg | - | 350 | 480 |
| Mn | 1.9 | 0.15 | 0.92 |
| Mo | 0.034§ | 0.0030 | 0.0060 |
| N (as $NO_3$) | - | 21 | 26 |
| Na | - | 1,200 | 2,500 |
| Ni | 0.011 | 0.0014 | 0.0060 |
| P | - | 0.11 | 0.14 |
| Pb | 0.0034 | 0.0010 | 0.0025 |
| $SO_4$ | - | 2,200 | 2,600 |
| Sb | 0.009§ | 0.0025 | 0.0025 |
| Se | 0.011 | 0.0094 | 0.011 |
| Si | - | 80 | 90 |

| Parameter (mg/L) | ANZG Default Guideline Value (DGV) 95% of Species Limit of Protection | Low Risk Trigger Value (LRTV) 80th percentile | Investigation Trigger Value ()ITV 90th percentile |
|---|---|---|---|
| Sn | 0.003§ | 0.0010 | 0.0025 |
| Sr | - | 2.8 | 3.8 |
| Ti | - | 0.0010 | 0.0025 |
| Tl | 0.00003§ | (0.0010)* | (0.0025)* |
| U | 0.0005§ | 0.0050 | 0.0068 |
| V | 0.006§ | 0.018 | 0.029 |
| Zn | 0.008 | 0.020 | 0.033 |
| TDS | - | 10,000 | 12,000 |
| §ANZG Low Reliability Trigger Value<br>*Metals that require lower detection limits for establishment of trigger value | | | |

Provisional trigger levels for groundwater levels and groundwater salinity have been developed bespoke to mine development progression and modelled hydrogeologic regime responses to dewatering and MAR. Bore-specific triggers and monitoring bore locations are presented in **Appendix 3.**

## 2.5 Surface Water Quality Trigger Levels

Provisional surface water quality trigger levels have also been developed by CBEC (2024), along with rationale (**Appendix 1**). The trigger levels are provided in Table 2-4 below.

**Table 2-4: Provisional Surface Water Quality Trigger Levels**

| Parameter (mg/L) | ANZG DGV 95% of Species Limit of Protection | 80th percentile |
|---|---|---|
| pH | 6.5 – 8.5 | 7.1-8.0 |
| EC (us/cm) | - | 290 |
| Alkalinity as CaCO, | - | 88 |
| Ag | 0.00005 | - |
| Al | 0.055 | 1.68 |
| As | 0.013 | - |
| B | 0.37 | - |
| Ba | - | - |
| Be | 0.0001 | - |
| Bi | 0.0007 | - |
| Ca | - | 16 |
| Cd | 0.0002 | - |
| Cl | - | 558 |
| Co | 0.0028 | - |
| Cr | 0.001 | - |
| Cu | 0.0014 | - |

# 3 Water Management Plan Provisions

## 3.1 Outcomes Based Environmental Management Provisions

**Table 3-1: Outcomes – Based: Management of Groundwater Levels and Quality to Impacts on Groundwater Users**

| **Management of Groundwater Levels and Quality to Impacts on Groundwater Users** |
|---|
| **EPA Factor:** Inland Waters<br>**EPA Objective:** To maintain the hydrological regimes and quality of groundwater and surface water so environmental values are protected.<br>**Key Environmental Values:** Beneficial use, pastoral station livestock<br>**Rationale:** Groundwater levels and flow direction, and salinity concentrations will change as a result of dewatering and MAR activities to the extent predicted in numeric modelling detailed in the ERD and PER.<br>**Key impacts and risks:** Reduced groundwater availability and/or and impacted groundwater quality from salinity.<br>**Outcomes:** Mitigate reduction in water availability and salinity increase at existing active pastoral bores within the predicted maximum vertical and lateral extents of modelled contours associated with dewatering and mounding. |

| **Indicators:** | **Response Actions:** | **Monitoring** | **Timing / Frequency of Monitoring** | **Reporting** |
|---|---|---|---|---|
| • **Trigger Levels:**<br>  – Groundwater Quality<br>  – Groundwater Level<br>• **Threshold Criteria:**<br>  – Groundwater Quality | • **Trigger level actions**<br>• **Threshold contingency actions** | | | |
| **Interim Trigger Levels - Groundwater Salinity**<br>TDS is at 4,500 mg/L | **Trigger Level Actions**:<br>• Investigate to establish causal factors such as equipment error, sampling error, climatic influences, individual bore characteristics i.e., infrastructure capacity.<br>• Undertake modelling to reforecast groundwater quality change<br>• Identify specific groundwater users at from re-forecasted water level change<br>• In conjunction with the stakeholder developed agreed threshold value and action plan to ensure continuity of water supply. | The proposed groundwater salinity monitoring bore network is shown in **Appendix 3.** | • Groundwater salinity profiling is to be undertaken at the salinity monitoring bores quarterly when MAR is being undertaken in the vicinity. Frequency may be reduced if the injected water is fresher than the MAR location.<br>• Monitoring to be conducted quarterly. | Annual Groundwater Monitoring Assessment |
| **Interim Threshold Citeria - Groundwater Salinity**<br>Agreed on case-by-case basis with stakeholder | **Threshold Contingency Actions:**<br>• Implement specific thresholds and action plans as agreed with stakeholder | | | Annual Groundwater Monitoring Assessment<br><br>Report the threshold exceedance to the CEO of DWER and DCCEEW within seven (7) days of the exceedance being identified<br><br>A report shall be provided to the CEO of DWER/DCCEEW within 21 days of the threshold criteria exceedance being reported |

| **Indicators:**<br>• **Trigger Levels:**<br>– Groundwater Quality<br>– Groundwater Level<br>• **Threshold Criteria:**<br>– Groundwater Quality | **Response Actions:**<br>• **Trigger level actions**<br>• **Threshold contingency actions** | **Monitoring** | **Timing / Frequency of Monitoring** | **Reporting** |
|---|---|---|---|---|
| **Interim Trigger Level - Groundwater Level**<br>Nominated drawdown extent monitoring bores indicates that the extent of groundwater level drawdown resulting from dewatering exceeds numerical model predictions and has the potential to impact other groundwater users exceeding 1 m relative to baseline groundwater levels in regional monitoring bores. | **Trigger Level Actions**<br>• Investigate to establish causal factors such as equipment error, sampling error, climatic influences, individual bore characteristics i.e., infrastructure capacity.<br>• Undertake modelling to reforecast groundwater quality change<br>• Identify specific groundwater users at risk of water quality change greater than 5,000 mg/L<br>• In conjunction with the stakeholder developed agreed threshold value and action plan to ensure continuity of suitable quality water is available | The proposed drawdown monitoring bore network is presented in **Appendix 3.** | • Continuous monitoring via logger when MAR not operational and quarterly assessment.<br>• Ongoing numerical modelling will be performed and reviewed utilising all available data. | Annual Groundwater Monitoring Assessment |
| **Interim Threshold Criteria - Groundwater Level**<br>Agreed on case-by-case basis with stakeholder | **Threshold Contingency Actions**<br>• Implement specific thresholds and action plans as agreed with stakeholder | | | Annual Groundwater Monitoring Assessment<br><br>Report the threshold exceedance to the CEO of DWER and DCCEEW within seven (7) days of the exceedance being identified<br><br>A report shall be provided to the CEO of DWER/DCCEEW within 21 days of the threshold criteria exceedance being reported |

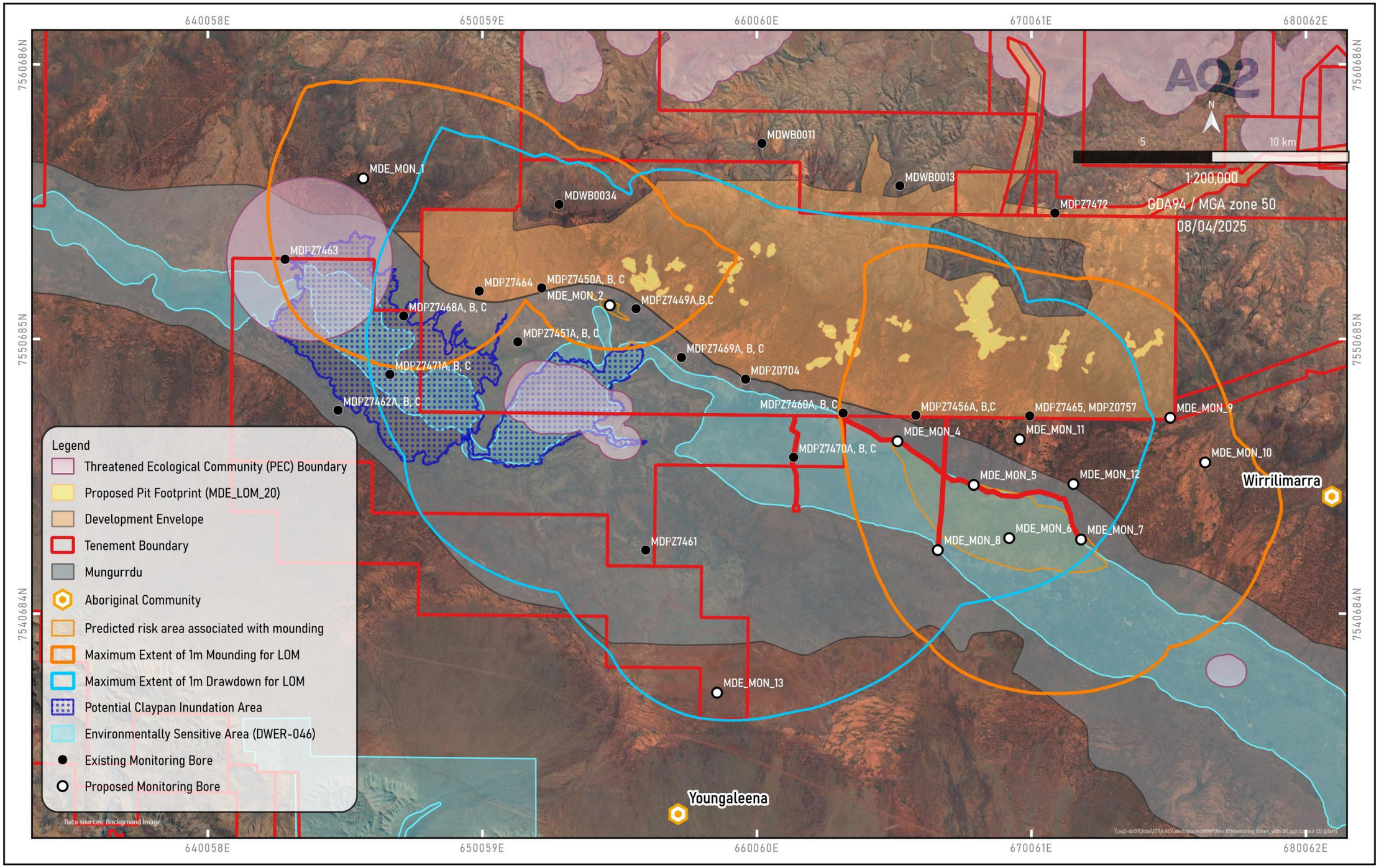



**Figure 4-1: Proposed Groundwater Monitoring Network**

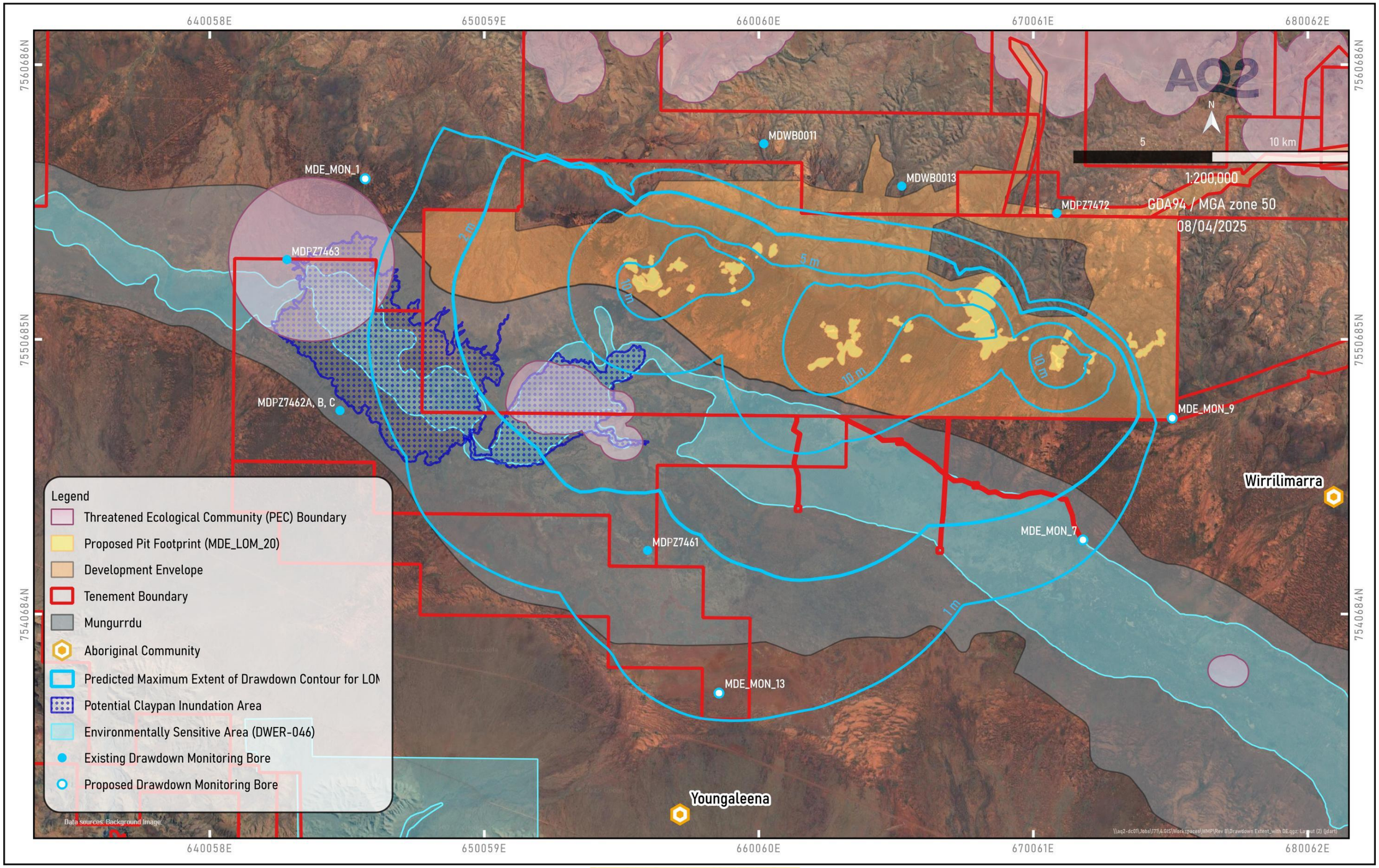



**Figure A3-2: Drawdown Monitoring Bores**

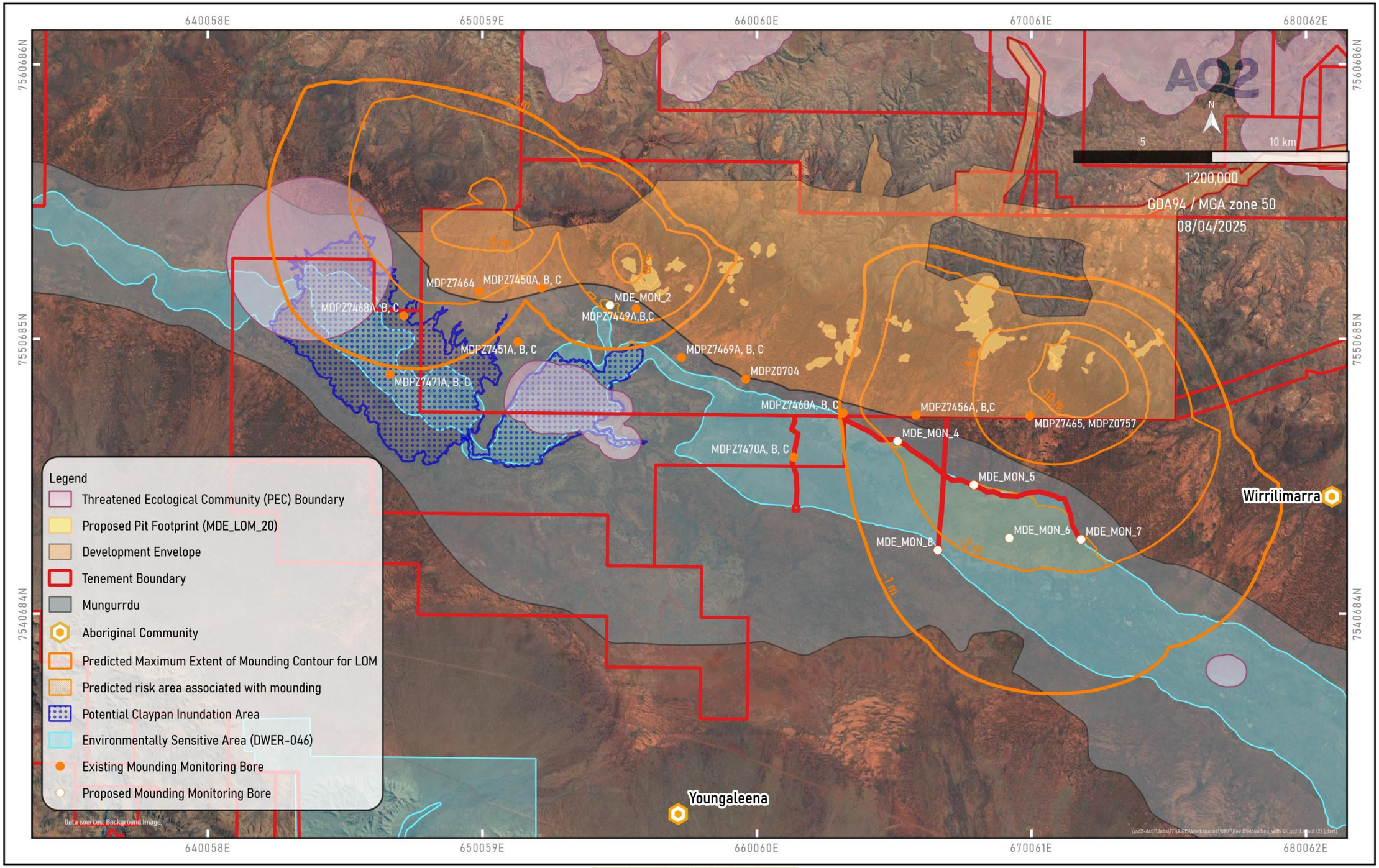



**Figure A3-3: Mounding Monitoring Bores**

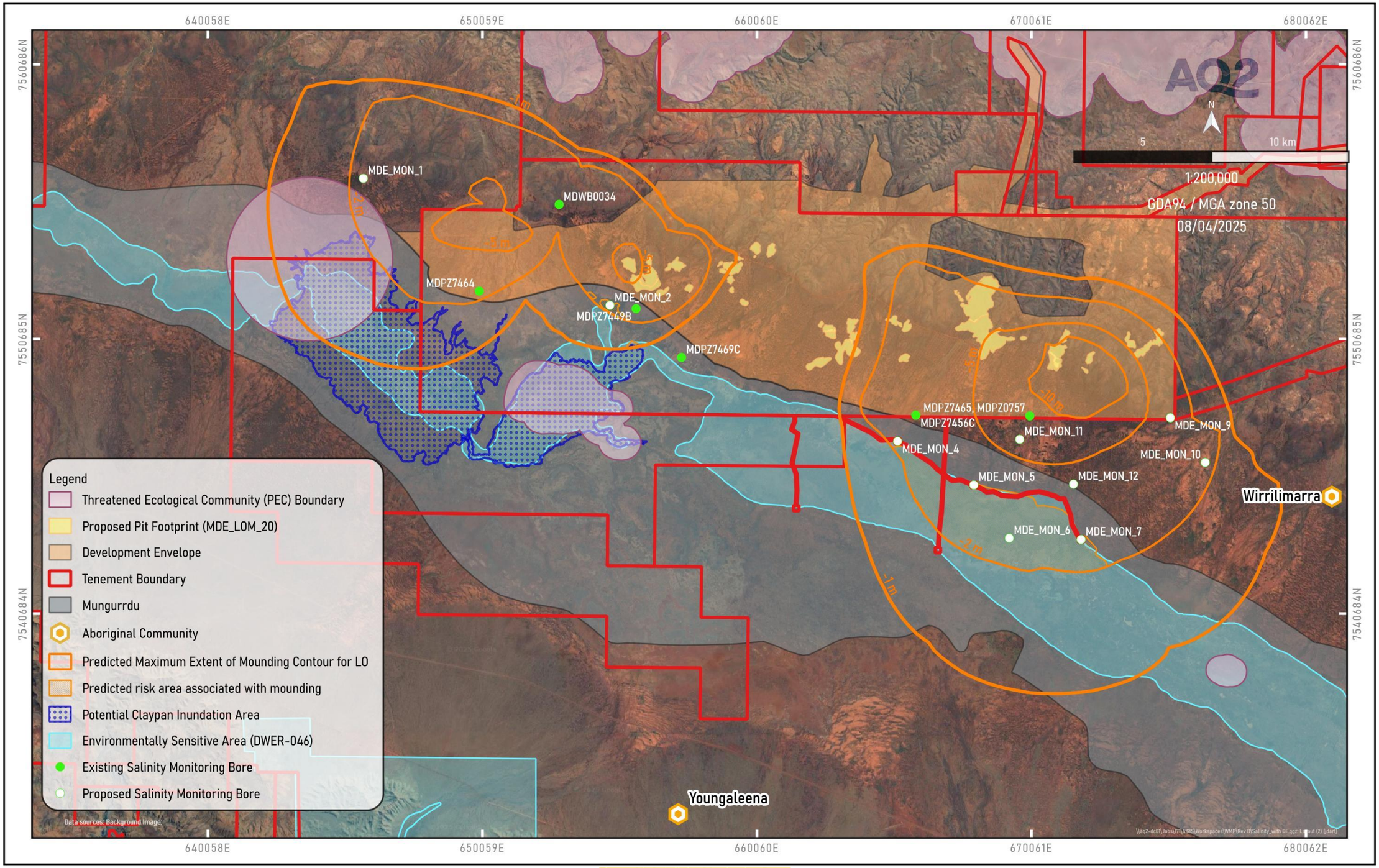



**Figure A3-4: Salinity Monitoring Bores**

# ATTACHMENT 4
# SUPPORTING DOCUMENT EXTRACTS FOR SUBMISSION RESPONSE 15

# EXECUTIVE SUMMARY

HanRoy Iron Ore Projects Pty Ltd (HanRoy) on behalf of Hancock Prospecting Pty Ltd (HPPL) is proposing to develop the Mulga Downs Iron Ore Mine (the Project) located approximately 210 km south of Port Hedland and 180 km northwest of Newman, in the Pilbara Region of Western Australia. The proposed Mulga Downs Hub and Rail Spur Project is a separate, standalone project as it is intended to be constructed and operated independently to the Mulga Downs Iron Ore Mine and is not considered in this assessment.

The Project encompasses the Murray's Hill and Mulga East Deposits within the Mulga East tenement (currently Retention Licence R47/12, with Mining Lease M47/1621 pending), with no development proposed over the adjacent / nearby exploration tenements of Malay Well (E47/2117) and Mulga West (E47/1315). However, for the purpose of these water and ecohydrological studies, the Study Area comprises the Mulga East and Malay Well tenements and areas of the Development Envelope which extend outside of these tenement boundaries. The Study Area represents the area within which baseline data has been collected, with additional ecohydrological assessments and limited (preliminary) groundwater investigations undertaken on the Mulga West tenement.

The proposed Project comprises seven mining areas (from west to east): Murray's Hill, Anticline Hill, Fridge West, Fridge Central, Fridge Hill, Horseshoe West and Horseshoe Hill. Approximately 20 of the pits are proposed to extend (to varying depths) below the groundwater level and will therefore require dewatering. The lowest estimated pit elevation is 388 mRL (i.e. ~12 to 16 m below the groundwater level).

The mine area is located on the northern slopes of the Fortescue Valley, within the Goodiadarrie Swamp catchment, which includes the Koodjeepindarranna and Gnalka Gnoona freshwater claypans plus other intermittent areas of surface water pooling.

AQ2 has undertaken baseline groundwater, surface water and ecohydrological studies to develop an integrated conceptual model for the Study Area, with specific focus on the culturally and environmentally sensitive wetlands of the Fortescue Valley, inclusive of the Gnalka Gnoona and Koodjeepindarranna Claypans. The conceptual model and natural (i.e. pre-mining) baseline are summarised below.

## Conceptual Model

Between 2018 and 2023 a total of 80 monitoring bores and 12 test production bores have been installed across the Mulga East, Malay Well and Mulga West tenements with hydraulic testing conducted on ten of the production bores to date and the majority of the monitoring bores. In addition, eight surface water monitoring stations have been installed (six within creek channels upstream of the Koodjeepindarranna and Gnalka Gnoona Claypans and two within the claypans themselves). Baseline groundwater and surface water monitoring has been undertaken since early 2019. It is noted that the Baseline data collection period commenced at the tail end of a significant drought in the area, which followed a sustained period of high annual rainfall totals in the Pilbara. During the Baseline period, no large, rare rainfall events have occurred.

Further field investigations have comprised ecophysiological measurements of vegetation (three dry season and one wet season programmes) at multiple locations in the Mulga East, Malay Well and Mulga West tenements and ecohydrological site inspections over the Mulga East and Malay Well tenement areas; with the latter comprising observations of hydrological features, geomorphology as well as vegetation composition and structure.

All field data from the drilling, testing and monitoring programmes have been combined with findings from previous hydrogeological investigations and groundwater level monitoring data dating back to 2008 to develop the conceptual hydrogeological model for the area. Whilst 2D flood modelling and claypan water balance modelling has been completed to assist in the development of a conceptual hydrological model for the area. Salient points regarding the current understanding of the hydrogeological / hydrological system are as follows:

- The Study Area is fully contained within the Fortescue Valley catchment, with Goodiadarrie Swamp located immediately to the south of the site. Runoff from smaller rainfall events is likely to be contained within the Goodiadarrie Swamp area, with discharge into the Lower Fortescue River likely to require larger rainfall events.

  The Koodjeepindarranna and Gnalka Gnoona Claypans have catchments that drain from both the north (Chichester Range) and the south (Hamersley Range) reporting to them. Very little transfer of water along the valley floor within the Goodiadarrie Swamp area is thought to occur, with no defined preferred drainage paths along the valley floor and a valley floor slope of ~0.01% (10 m elevation fall over 80 km length). Baseline surface water flood modelling has been used to assist in the definition of the claypan catchment areas, which vary depending on the magnitude of the rainfall event. Based on water level monitoring data collected across the site, it appears that rainfall events exceeding a rainfall depth of 35 mm are required to generate runoff in the Chichester Range drainage lines and 90mm of rain to result in inundation in the claypans. Inundation within the claypans appears to occur frequently and it is likely that hydrologic responses from average, relatively frequent rainfall events are important in maintaining ecosystem function at the claypans (i.e. ecosystem function does not just rely on high magnitude low frequency runoff events). The low salinity of the ponded water within the claypans and the recorded depth to groundwater below the claypans indicates that the water is sourced from surface water runoff. Comparing the observed water level recession in the claypans from recent rainfall events to evaporation data indicates that evaporation plays the primary role in removing collected water from the claypans, with only minor seepage to the groundwater system. Residual salts from this evaporative loss are leached into the groundwater system under the claypans by the small component of seepage. Over time, this is thought to have resulted in saline groundwater beneath the claypans.
- The groundwater system is hosted in predominantly high permeability bedrock and valley fill, with the only low permeability aquitards being the fresh dolomite of the Wittenoom Formation underlying the valley area and the fresh Jeerinah and Marra Mamba Formations that underlie the orebodies and outcrop along the northern boundary of the Study Area. Secondary permeability resulting from mineralisation, fracturing and weathering, is evident throughout most of the Marra Mamba Formation and the overlying West Angela Member; these units are in hydraulic connection and are believed to form a transmissive basement aquifer. Although no faults have been mapped in the area to date, it could be that this basement aquifer has a lower bulk-permeability than currently adopted with a compensatory increased permeability along particular fault lines. Additionally, it is anticipated that faulting in the Malay Well area has resulted in complexities which are not represented in the current geological model.
- The valley fill has been categorised into the following units: Basal Crete, Pisolite / CID, Undifferentiated Tertiary (inclusive of alluvial fans and scree on the valley flanks) and Upper Calcrete. Although the composition and nature of these units are variable, derived permeabilities are generally high for all the units, with only limited intervals of low permeability clay which do not seem to be continuous.
- The transmissive nature of the bedrock and valley fill is reflected in the low hydraulic gradient observed across the orebody area and valley area, with a steeper gradient only evident along the northern boundary of the Study Area (across the low permeability Jeerinah Formation). Groundwater flow generally follows the topography, flowing from the higher elevations into the valley and then in a northwesterly direction along the valley. The depth to groundwater is shallow in the lower lying, valley

areas (i.e. approximately 3 to 5 mbgl) and increases with elevation, to depths of up to 45 mbgl in the more elevated areas.

- Groundwater across the Study Area ranges from fresh (180 mg/L TDS) in the upper reaches of the groundwater system, to saline (17,000 mg/L TDS) across the valley area, with salinity profiling data confirming saline groundwater originating from the claypans and extending along the valley as well as beneath the orebodies closest to the claypans (although the mining of these orebodies is not part of the proposed mine plan).
- Recharge to the groundwater system occurs as diffuse recharge from rainfall events, both on the valley flanks where the Marra Mamba outcrops and as infiltration into the Tertiary / Quaternary overburden where runoff is focused on the valley floor.

The findings of the ecohydrological site inspection, combined with remote sensing data and available vegetation mapping and soil assessments was used to evaluate the ecohydrological behaviour of the landscape and define ecohydrological units (EHUs) for the Study Area. Table ES1 summarises the key elements and functional aspects of each EHU.

A detailed ecohydrological baseline assessment of the Fortescue Valley environs has also been undertaken, involving characterisation of major vegetation types and evaluation of the ecological water requirements of the E. victrix woodland communities. The potential groundwater dependence of vegetation in the Fortescue Valley has been evaluated using seven assessment tools outlined in the Australian groundwater-dependent ecosystems toolbox (Richardson et al. 2011). It is concluded that groundwater dependent vegetation does not occur in the Study Area, based on the following supporting evidence:

- Groundwater underlying the Fortescue Valley environs is generally brackish/saline and therefore does not constitute a favourable water source for floodplain vegetation.
- Regolith characteristics in the Fortescue Valley environs suggest that vegetation rooting depth is impeded by massive calcrete or dense, low permeability clay layers. Owing to access and ground disturbance constraints due to heritage values in these areas, direct observation of tree roots were limited to several sump pits associated with hydrogeological drilling.
- Across the Study Area, there are no areas of persistently high greenness as measured by time series NDVI imagery.
- Time series pre-dawn leaf water potentials indicate the tree-root zones are in unsaturated media with widely varying soil matric pressure, that is generally lower (i.e. more negative) than -0.5 MPa. Also taking into consideration the potential influence of brackish groundwater, this precludes the roots being in groundwater or at the capillary fringe.
- Based on water balance modelling supported by on-ground vegetation measurements (i.e. woodland tree size and density), surface water inputs were calculated to be sufficient to support the density of trees occurring in the Fortescue Valley E. victrix woodland communities. The more dense woodland stands are associated with better structured soils with relatively higher plant-available water storage capacity.

## Table ES1 Summary of Landscape Ecohydrological Units in the Area of Interest

| | EHU | Summary description | Hydrological behaviour |
|---|---|---|---|
| Chichester Range Uplands | Upland Rises | Peaks and upper hillslopes; shallow or skeletal soils overlying basement rocks. | Runoff source areas – shed water to downgradient landscape units. |
| | Upland Valleys | Broader depressions in the Chichester Range where sediments have accumulated, facilitating runoff capture/storage and denser vegetation. | Local sink area, receiving diffuse flow from Upland Rises Surplus from overtopping delivered into Upland Drainages. |
| | Upland Drainages | Single thread channels with cobble beds that traverse and exit the Chichester Range. Unconfined to semiconfined by hills of basement rocks. Channel beds mostly unvegetated with regular gravel bars and scour pockets. Scattered *E. victrix* trees in deeper soil pockets fringe the channels. | Transfer zones, receive runoff from upland catchments and transmit into Alluvial Fan Drainages. |
| | Basaltic Tablelands | Level to very gently inclined basaltic plains. Soils mostly comprise self-mulching cracking clays supporting tussock grassland communities. | Local sink area, receiving direct rainfall or locally distributed runoff |
| Alluvial Fans | Alluvial Fan Washplains | Banded vegetation (mulga and Snakewood) on a gently sloping stony plain. Runoff is generated in intergrove areas and mostly captured in the adjacent downslope grove. | Local sink area receiving rainfall. Surplus from overtopping delivered into Alluvial Fan Drainages. |
| | Alluvial Fan Drainages | Low sinuosity channels with narrow floodplains, collectively constituting drainage tracts, which dissect the Alluvial Fan Washplains. Supports relatively dense mulga shrubland. | Transfer zones, receive runoff from Upland Drainages and transmit into the Fortescue Valley. |
| Fortescue Valley Flats | Valley Calcrete Plains | Expansive unit of the Fortescue Valley. Variably dissected and overprinted by alluvium, giving rise to a subtle mosaic of benches, rises and depressions. Vegetation type and density related to soil depth, which is constrained by shallow calcrete (generally within 50 cm of the surface). | Benches and rises function as runoff source areas once internal storage is exceeded, shedding water to immediately adjacent units. |
| | Valley Stony Flats | Stony flats in the Fortescue Valley, generally on the valley margins where slope (and hence runoff) is insufficient to support banded vegetation. Prone to accumulation of salts due to poor infiltration; only sparsely vegetated. These areas support transient but not persistent ponding. | Receive inflows from Alluvial Fan Drainages. The flat stony pavement surfaces function as runoff source areas once internal storage is exceeded, shedding water to immediately adjacent units. |
| | Valley Loamy Flats | Broad flats typically inset from the valley margins, where accumulated sediment and organic matter create better soil structure and high infiltration rates. Relatively deep soils (may exceed 100 cm). High surface roughness contributes to some localised surface water redistribution within the unit.<br>These areas support dense patches of woodland and grassland vegetation; with vegetation types related to subtle changes in physical and chemical soil properties. | Predominantly sink areas that receive runoff from adjacent units (Valley Stony Flats and Calcrete Plains). Overtopping is uncommon and associated with large cyclonic rainfall events. |
| | Valley Ponding Flats | The lowest depressions in the Fortescue Valley where water ponds; typified by high clay content topsoil that impedes infiltration. Prone to accumulation of salts due to poor infiltration; only sparsely vegetated. These areas support persistent ponding. | Sink areas that collect rainfall and receive runoff from adjacent units (Valley Stony Flats and Calcrete Plains, and more rarely Loamy Flats). |

rate test (with salinity readings fluctuating between 3,400 and 3,500 µS/cm). However, as shown in Figure 6.7, salinity profiles for the pumped bore show increasing salinities at depth from before the step rate test (5660 µS/cm), before the constant rate test (7135 µS/cm) and after the constant rate test (8000 µS/cm), potentially indicative of the up-coning of the deeper, more saline groundwater.

Salinity profiles at the adjacent nested monitoring bores are also presented in Figure 6.7. No change in salinity is evident in the shallow monitoring bore (MDPZ7469C), whilst the intermediate monitoring bore (MDPZ7469B) shows a minor increase in salinity from 3,700 to 3,900 µS/cm from before and after the test pumping. The deep monitoring bore (MDPZ7469A) indicates an increase from 18,500 µS/cm before the step rate test to 18,900 µS/cm before the constant rate test and then a decrease in salinity to 17,900 µS/cm following the constant rate test. It is anticipated that the initial increase observed at the MDPZ7469A is probably the result of on-going recovery following the installation of MDPB0016 (rather than due to the short step rate test pumping), whilst the decrease in salinity resulting from the constant rate test may be attributable to the lateral flow of fresher groundwater towards test area.

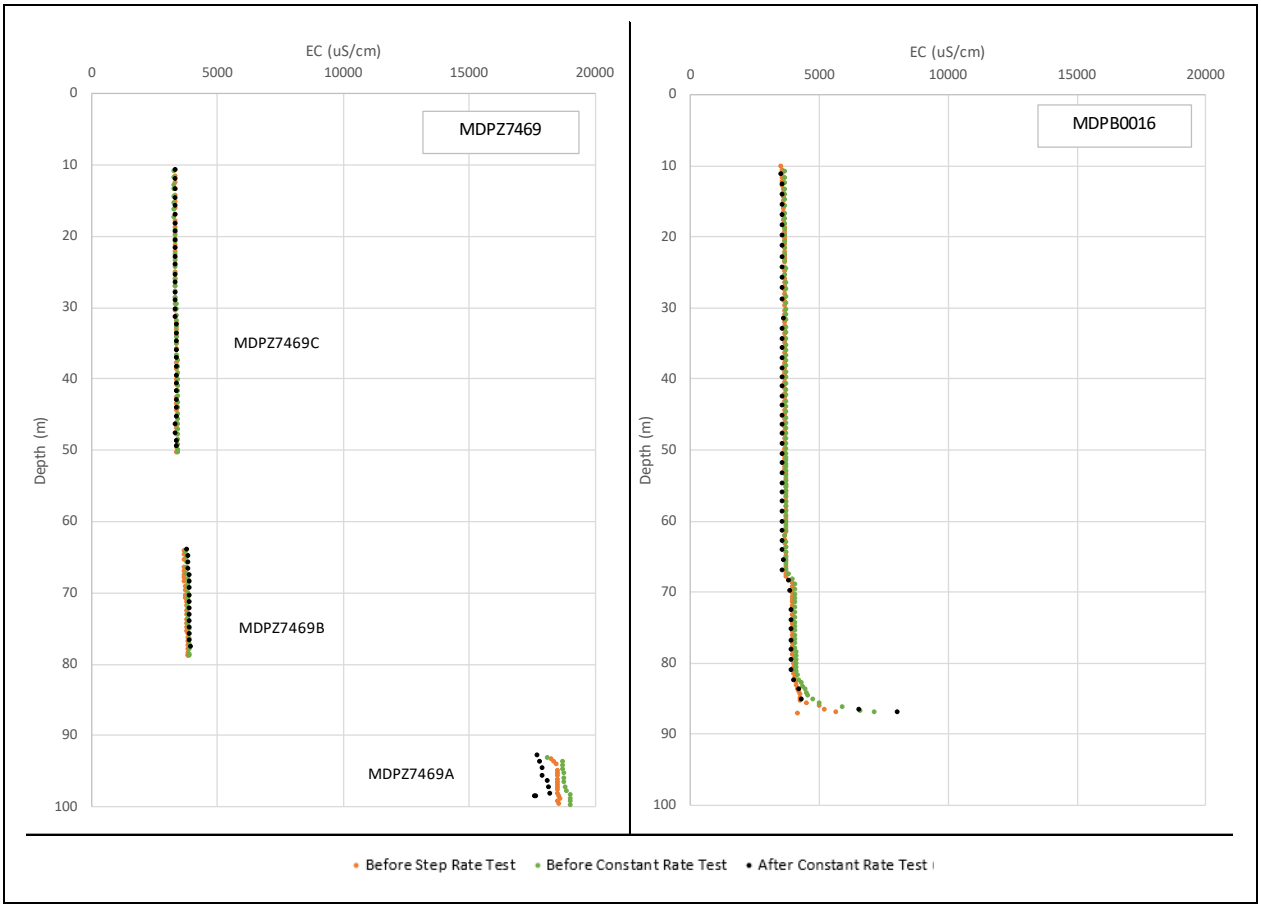



Figure 6.7 Salinity Profiles during the Pumping Test on MDPB0016

## 6.4 Groundwater Levels and Flow Direction

The surveyed bore collars and measured groundwater levels across the Study Area have been used to plot groundwater level contours (refer Figure 6.8 and Figure 6.9). Additionally, historical site water levels (measured at open mineral exploration holes during previous resource evaluation drilling programmes) and recorded water levels from DWER's database (together with NASA's Shuttle Radar Topography Mission (SRTM) data to set bore elevations) have been used to provide additional guidance to the contouring; noting that the SRTM data has been found to be inaccurate in this area, when compared to the bore survey data.

The water table elevation across the extended Study Area (inclusive of Mulga West) ranges between approximately 385 mRL and 420 mRL, The depth to groundwater  In the Mulga East / Malay Well area, the hydraulic gradient is gentle across the lower lying areas, indicative of transmissive aquifers, and steepens along the northern boundary of the Study Area, indicative of lower permeability units (which is consistent with the presence of the Jeerinah Formation and fresh Marra Mamba aquitard). The transition from the Jeerinah aquitard to the Altered Marra Mamba aquifer may also be responsible for the abrupt bends observed in the groundwater contours in the northern Mulga East area (refer Figure 6.9). Hydraulic gradients also steepen down gradient of the Study Area, at the western end of Mulga West, indicative of a less transmissive setting, the narrowing of the valley and / or additional groundwater throughflow (from the Hamersley Ranges / Hamersley Gorge). Localised areas of minor groundwater mounding or potential preferential flow along more permeable structures may be present across the Mulga East orebody area, however, there is insufficient geological and hydrogeological data to validate this concept.

The depth to groundwater is presented in Figure 6.10. This has been derived from available LiDAR data and the contoured groundwater level surface for December 2021 (Figure 6.8). In the Mulga East / Malay Well area the depth to groundwater is shallow in the lower lying, valley areas at approximately 3 and 5 mbgl and increases with elevation, to depths of up to 45 mbgl (at MDPZ7467) in the more elevated areas (i.e. to the north of the inferred resource area). Although no drilling has taken place on the claypans and at the channel pools due to the environmental and cultural heritage significance of these areas, the derived depth to water (i.e. Figure 6.10) indicate these features are not groundwater-related. Further discussion regarding the conceptualisation of the claypans is presented in Sections 4 and 10.

In assessing the vertical gradients between adjacent bores installed at different depths (i.e. the clustered and paired bores), only the manual piezometric measurements (taken after bore installation and during each monitoring round) have been considered due to the potential variations in accuracy with the different depth ratings of pressure transducers. The majority of bores show minimal differences in piezometric head indicating hydraulic connection between the measured overlying / underlying units.

Vertical gradients are only evident at seven cluster bore locations from the 2018/2019 field programme (MDPZ7449, 7451, 7457, 7460, 7462, 7469 and 7471) where the screened units of the bores are separated by an intervening low permeability material, with thicknesses ranging between 2 and 30 m. The distribution of vertical hydraulic gradients within the sequence varies spatially although without any specific trend or distribution. This is believed to be a result of the variable distribution of permeability within the Tertiary deposits.

Only two paired monitoring bore completions were installed during the 2021 drilling programme (MDPZ9212D & S and MDPZ9215D & S) and both locations show downward hydraulic gradients. The collars of the 2023 bores have yet to be surveyed to accurately assess vertical gradients.

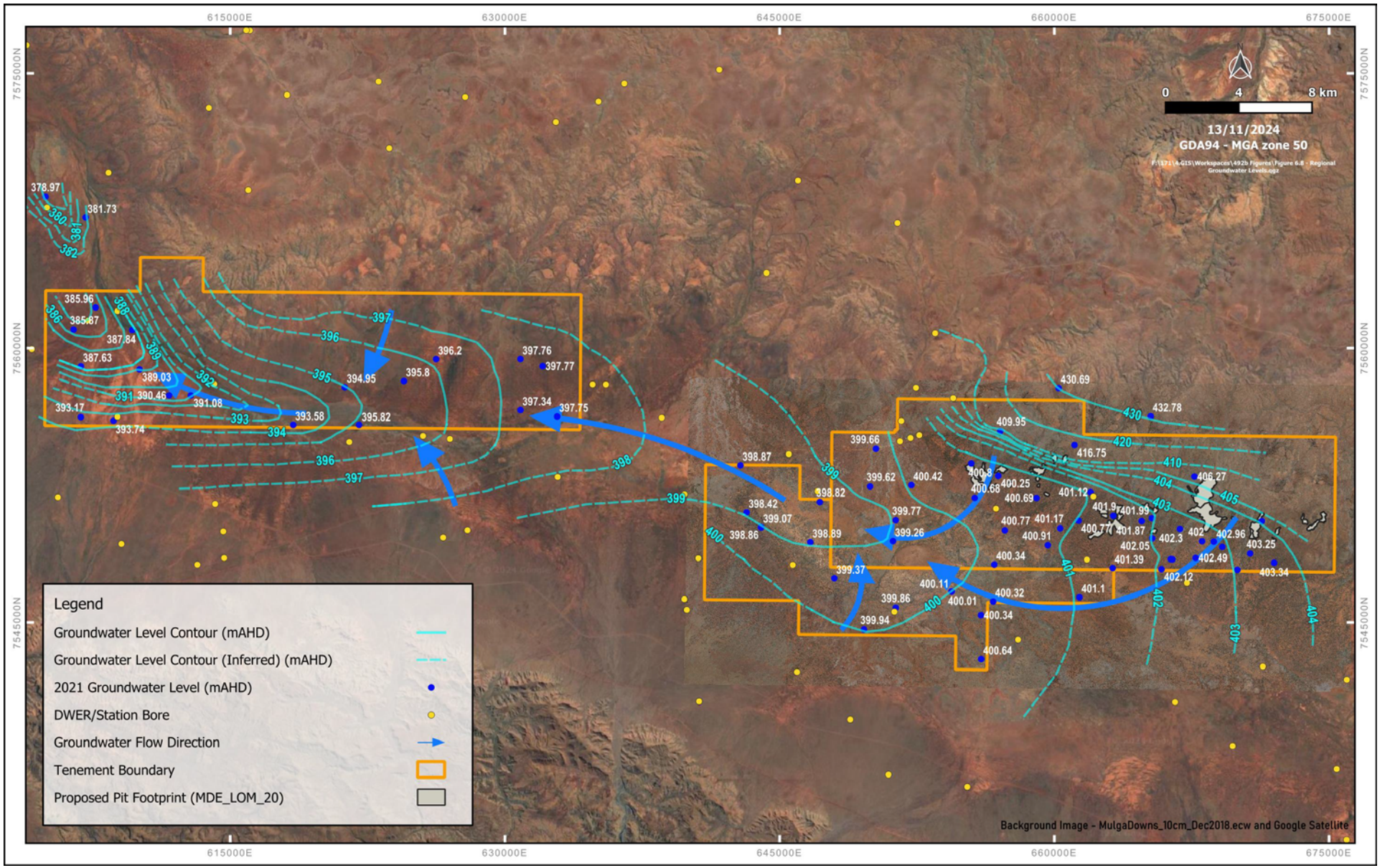



Figure 6.8 Regional Groundwater Level Contours (December 2021)

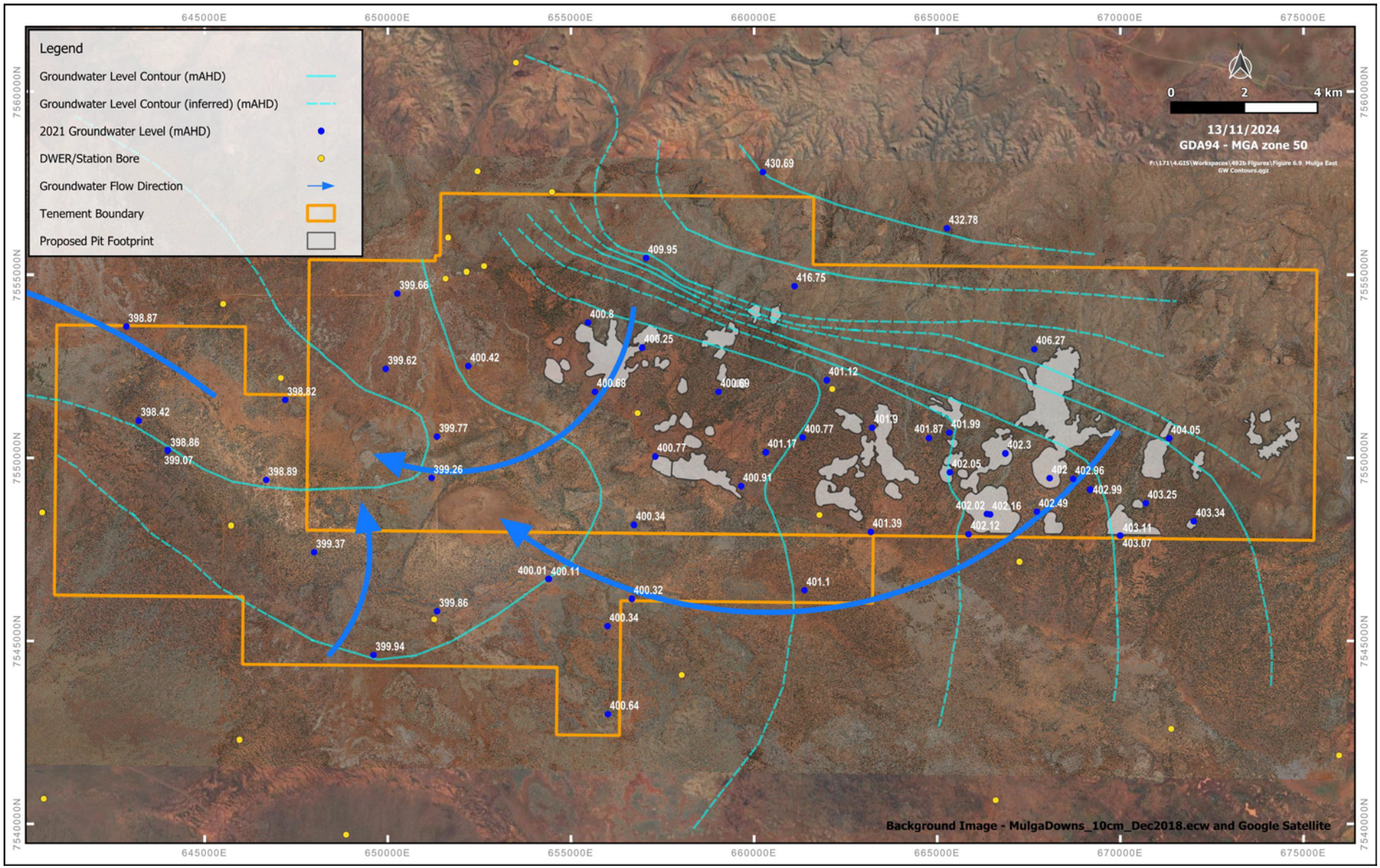



Figure 6.9 Groundwater Level Contours across Mulga East & Malay Well (December 2021)

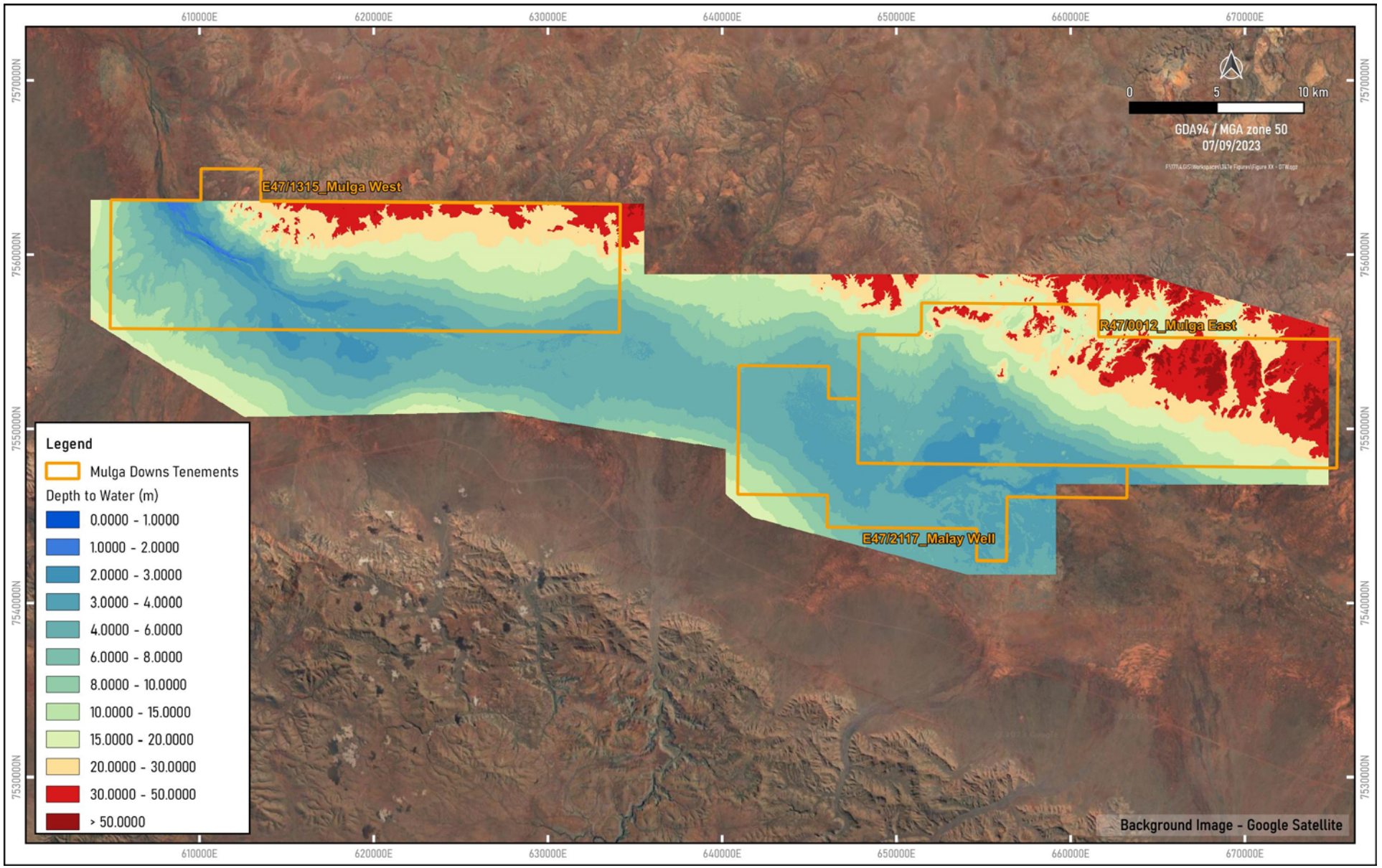



Figure 6.10 Regional Depth to Groundwater (December 2021)

# 6. ECOHYDROLOGICAL IMPACT ASSESSMENT

## 6.1 Overview

Implementation of the Project will result in changes to the hydrological regime of the Fortescue Valley within and proximal to the Study Area. Relevant mechanisms of change include:

- Groundwater drawdown caused by orebody dewatering.
- Groundwater mounding caused by the discharge of surplus water via MAR.
- Surface catchment modifications resulting in changed surface water regimes, in particular reduced inflows to portions of the valley environment.

The conceptual ecohydrological model provides a basis for evaluating how these changes could affect the Fortescue Valley vegetation and claypans.

## 6.2 Groundwater Drawdown and Mounding

As detailed in Section 5, ongoing groundwater management associated with orebody dewatering and disposal of surplus water will be required over the life of the Project. Numerical groundwater modelling has been undertaken (GWC 2024, Appendix F) to predict the dewatering and MAR rates required to meet the proposed mining scenario, as well as the associated changes in groundwater levels across the Study Area, throughout the LOM.

A schematic description of the effect of altered groundwater levels on the Fortescue Valley *E. victrix* woodlands and adjacent claypans is shown in Figure 6.1. Salient aspects are as follows:

- Given that the vegetation is inferred to be disconnected from the groundwater system under baseline conditions, a reduction in groundwater levels is not predicted to impact the terrestrial environment. A lowered water table would increase the thickness of unsaturated sediments, which may slightly reduce the responsiveness of the aquifer to recharge events. However, these sediments are not considered to be accessible to plant root systems.
- Groundwater mounding will also not impact the terrestrial environment if there is no interaction between the water table and the overlying soil profile occupied by tree roots, either by direct intersection or via capillary rise. Based on the ecohydrological conceptual model and measured baseline conditions, the threshold groundwater depth above which interaction with vegetation may occur is estimated to be about 2.0 mbgl (AQ2 2024). If water levels rise above this threshold, the following system responses are predicted:
    - Tree roots that become inundated for more than a few weeks to months will senesce, due to oxygen deficiency, effectively pruning the deeper roots. Consequently, vadose storage of Plant Available Water (PAW) will be reduced, although soil water depletion in this zone during drought phases would be partially offset by inputs from capillary rise. If sustained over long periods, this could result in vegetation leaf area index adjustments (either increased or decreased) based on the net effect of interactions between climate (droughts or floods) and soil water replenishment processes. Note that in the extreme case of prolonged saturation of the entire root system, tree deaths could occur.
    - Owing to impeded drainage in the valley environs, waterlogging associated with flood events may be more spatially extensive and of longer duration, causing increased exposure of vegetation to this stress agent relative to baseline conditions.
    - Salt may accumulate in the upper soil profile resulting from the combined effects of increased evaporative concentration and/or reduced salt leaching into the deeper profile. If sustained over long periods, this could have adverse impacts on vegetation health by reducing soil water extractability. Claypan water quality could also be affected by increased salt loads.

- With the recession of water table associated with decreased MAR, surviving tree root systems (i.e., above zone of prolonged saturation) would be expected to gradually recolonise the desaturated zone down to root impeding layers and salt flushing processes would be reinstated. However, the rate of system recovery is difficult to predict and it may be limited to younger trees and/or recruits (where the root systems of older trees have become determinate).

Accordingly, potential negative impacts on *E. victrix* woodland vegetation communities are associated with groundwater mounding into the vegetation root zone. The magnitude of impacts is likely to be directly proportional to the duration of elevated water levels and the degree to which root systems are exposed to inundation.

The maximum extents of groundwater mounding as a result of the proposed MAR have been predicted using the numerical groundwater model over the life of the Project (refer Section 5.5.6) and an analysis has been undertaken to assess uncertainties relating to the aquifer parameters (refer Section 5.7.1). To assess uncertainties relating using SRTM ground elevation data in the groundwater model, the model mounding outputs, together with the regional depth to groundwater data, have been used to identify areas where there is a risk of maximum groundwater levels lifting to within 2.0 m of the ground surface (i.e., 2 mbgl). These areas are shown in Figure 6.2; they occur down gradient from the Fridge / Horseshoe South MAR Borefield and the Murray's Hill / Anticline Hill MAR area coinciding with the break of slope. Also shown in Figure 6.2 is the location of the ecohydrological unit associated with the occurrence of *E. victrix* woodland communities (i.e., the "Loamy Flats EHU, refer Section 2). The predicted drawdown / mounding hydrographs from the numerical groundwater modelling for key locations in the Fortescue Valley are shown in Figure 6.3.

Salient aspects regarding the modelled groundwater mounding are summarised as follows:

- When interpreting Figure 6.2 , it is important to recognise that there are no measured groundwater levels off-tenement (i.e., to the south of the Fridge / Horseshoe South MAR Borefield) owing to access restrictions. Therefore the depths to groundwater in these areas are inferred. Accordingly, the predictions of groundwater rising above the 2 mbgl threshold are indicative only; they should not be regarded as certain or spatially definitive. Rather these areas are at risk of exposure to shallow water tables for periods of time making them a focus for ongoing monitoring and adaptive management. Higher risk is associated with greater durations of elevated water levels.
- As indicated in Figure 6.2 and Figure 6.3, very little groundwater mounding is predicted in proximity to the claypan areas. Therefore, the risk of groundwater rising above the 2 mbgl threshold is negligible.
- Predicted peaks in water levels in the area to the south of Murray's Hill are temporary and recede in a matter of months (refer Figure 6.3). In this area the risk of groundwater rising above the 2 mbgl threshold is considered to be low.

Longer term peaks in water levels to the south of the Fridge / Horseshoe South MAR Borefield are predicted (refer Figure 6.3). In this area the risk of groundwater rising above the 2 mbgl threshold is considered to be high. However, the topographic surface in the groundwater model for this area is based on SRTM data for which the predicted water levels did not trigger a requirement to reduce MAR and lower water levels. Therefore, further optimisation and redistribution of MAR to reduce groundwater mounding in this area is possible under an adaptive management framework.

In overall terms, potential impacts to the Fortescue Valley *E. victrix* woodland communities from groundwater mounding are likely to be spatially restricted and transient over the life of the Project. However, given the level of uncertainty associated with predictive modelling of groundwater levels, and noting that the tolerance of vegetation to groundwater level change is site specific and not easily determined, a program of ongoing monitoring of groundwater levels and vegetation health over the life of the Project is warranted.

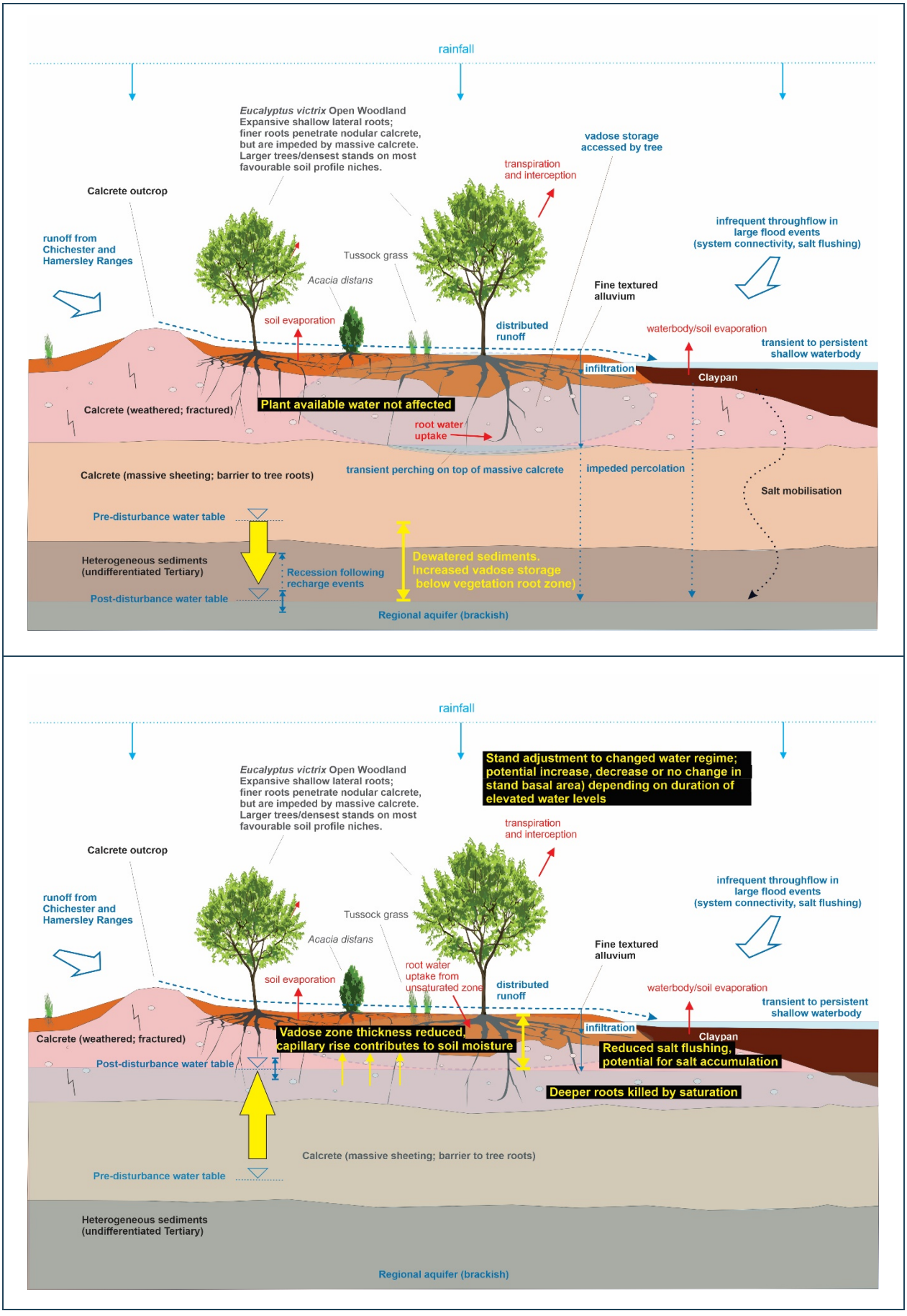



Figure 6.1 Predicted system responses to lowered (top) or lifted (bottom) water tables in the Fortescue Valley environs

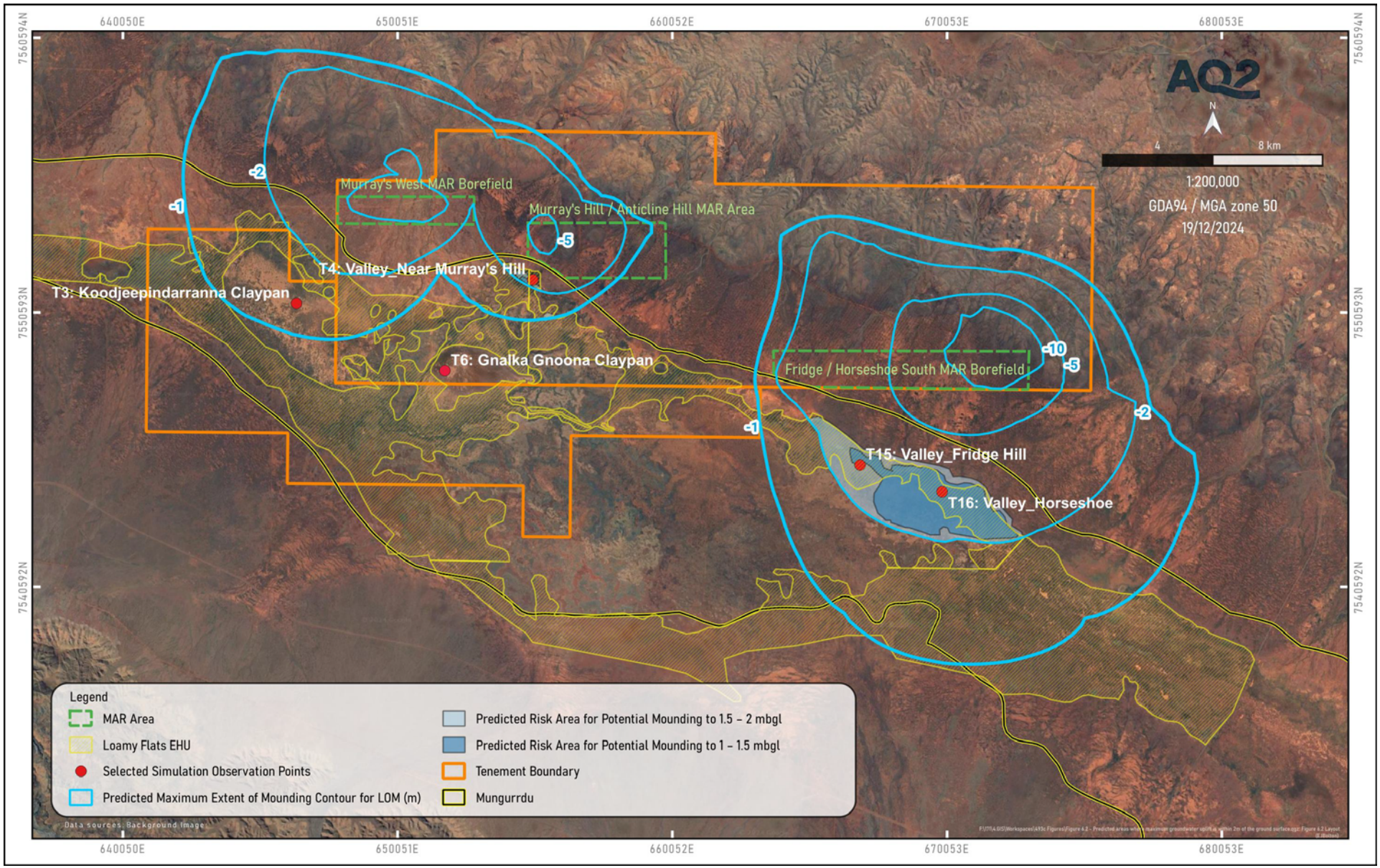



Figure 6.2 Predicted Areas where Maximum Groundwater Mounding is within 2 m of the Ground Surface over the Life of the Project


Figure 6.3 Predicted Drawdown / Mounding Hydrographs for the Valley Area (reproduced from GWC, 2024)

## 6.3 Surface Water Change

### 6.3.1 Characterisation of Surface Water Change

Two broad types of changes to the surface water regime are anticipated under the LOM Development scenario:

- Increase in flood levels caused by increased inflows from upgradient areas. By inference, this would be associated with greater infiltration and soil water replenishment relative to the baseline condition. Potentially, the duration of soil saturation immediately following rainfall and flow events could be increased. Prolonged waterlogging can be detrimental to plants by drowning and killing root systems; and
- Reduction in flood levels caused by reduced inflows from upgradient areas. By inference, this would be associated with less infiltration and soil water replenishment relative to the baseline condition. The significance of reduced soil water replenishment is principally related to the rate of PAW depletion between replenishment events, which is a function of soil water storage capacity, vegetation density/leaf area index and the duration of drought phases. Vegetation can naturally adjust to reduced soil water availability by down regulating plant water use (e.g., stomatal closure) or reducing leaf area index (via leaf shedding or in more extreme cases vegetation density reduction by partial senescence).

Importantly, the hydrological impact assessment identifies that all baseline hydrological processes in the Study Area will be maintained. The predicted hydrological change primarily relates to the magnitude and duration of flooding events.

As detailed in Section 4.3, progressive reductions in AEP flood frequency and/or increases in flood magnitude are associated with:

- Increases in maximum predicted flood depth differences relative to baseline conditions.
- Increases in predicted velocities along the diversions and in the Fortescue Valley immediately downstream of the diversions.

This indicates that mining development will have a greater effect on infrequent, large flow events than smaller, more frequent flow events.

However, based on the water balance assessment of Fortescue Valley woodland vegetation communities completed by AQ2 (2024), more frequent smaller events are of the highest importance for maintaining adequate PAW to minimise vegetation drought stress. This is a consequence of the constrained depth of the vegetation root zone and hence PAW storage limits of the soil profile. Smaller replenishment events top up the soil water reservoir but in larger events the storage capacity is exceeded; with the surplus water either exported to other areas or evaporated in situ. It follows that the amount of time between effective rainfall events (i.e., sufficient to contribute to PAW) is the most important factor determining vegetation water supply, rather than the magnitude of these events. This also means that the vegetation communities are periodically exposed to drought and waterlogging stress under baseline conditions and have adaptations to cope with this.

Notably, the claypan water balance modelling (refer Section 4.3) suggests minimal impact on the surface water regime of the claypans resulting from implementation of the Project. This is attributable to the natural impediments to water transfer into the claypans from the broader landscape during small and medium sized rainfall events, consistent with the landscape ecohydrological conceptual model (AQ2 2024, summarised in Section 2).

### 6.3.2 Spatial Footprint of Hydrological Change

The net difference in flood levels between the Baseline (pre-development) scenario and the LOM Development scenario for the 63% AEP rainfall event (i.e., ~1 year average recurrence interval) is shown in Figure 6.4. In the vast majority of areas south of the proposed surface water management structures, the predicted change is within ± 3 to 10 cm of the baseline condition.

Under the LOM Development scenario, the principal areas subject to increased flood levels (relative to the baseline condition) include (refer to Figure 6.4):

- An area of approximately 40 ha associated with the drainage diversion between Murray's Hill and Anticline Hill where increased flood levels of approximately 3 cm (but all <5 cm) are predicted (point Inc_1 on Figure 6.4). This area includes the terminal end of an alluvial fan drainage tract, comprising vegetation dominated by mulga.
- An area of approximately 25 ha southeast of the drainage diversion between Fridge Hill and Horseshoe West where increased flood levels >5 cm are predicted (point Inc_2 on Figure 6.4). This area is outside the extent of Project vegetation mapping. From aerial photography, the area appears to support patchy vegetation (mulga and scattered *E. victrix*) and is blanketed in fine depositional sediments that are characteristic of the alluvial fan drainage termini on the valley margins.

The principal areas subject to decreased flood levels (>5 cm decrease relative to the baseline condition) include:

- An area of approximately 8 ha southwest of Murray's Hill (point Dcr_1 on Figure 6.4). This area occurs within the Loamy Flats EHU comprising mulga and scattered *E. victrix* on the valley margins.
- An area of approximately 300 ha southwest of Fridge Central (point Dcr_2 on Figure 6.4; zoomed in image provided in Figure 6.5). The majority of this area is outside the extent of Project vegetation mapping, however from the on-ground inspection (refer to Figure 6.5) it largely comprises Stony Flats EHU that are blanketed in fine depositional sediments with patchy vegetation dominated by mulga and scattered *E. victrix* in southern portions that transition into the Loamy Flats EHU. Although a channel pool is located within the area of predicted flood depth reduction, the LOM Development flood modelling for a 63% AEP rainfall event (Figure Appendix C1, Appendix C) predicts that surface water flow to the pool is not interrupted (i.e., the pool will continue to be supported by surface water).

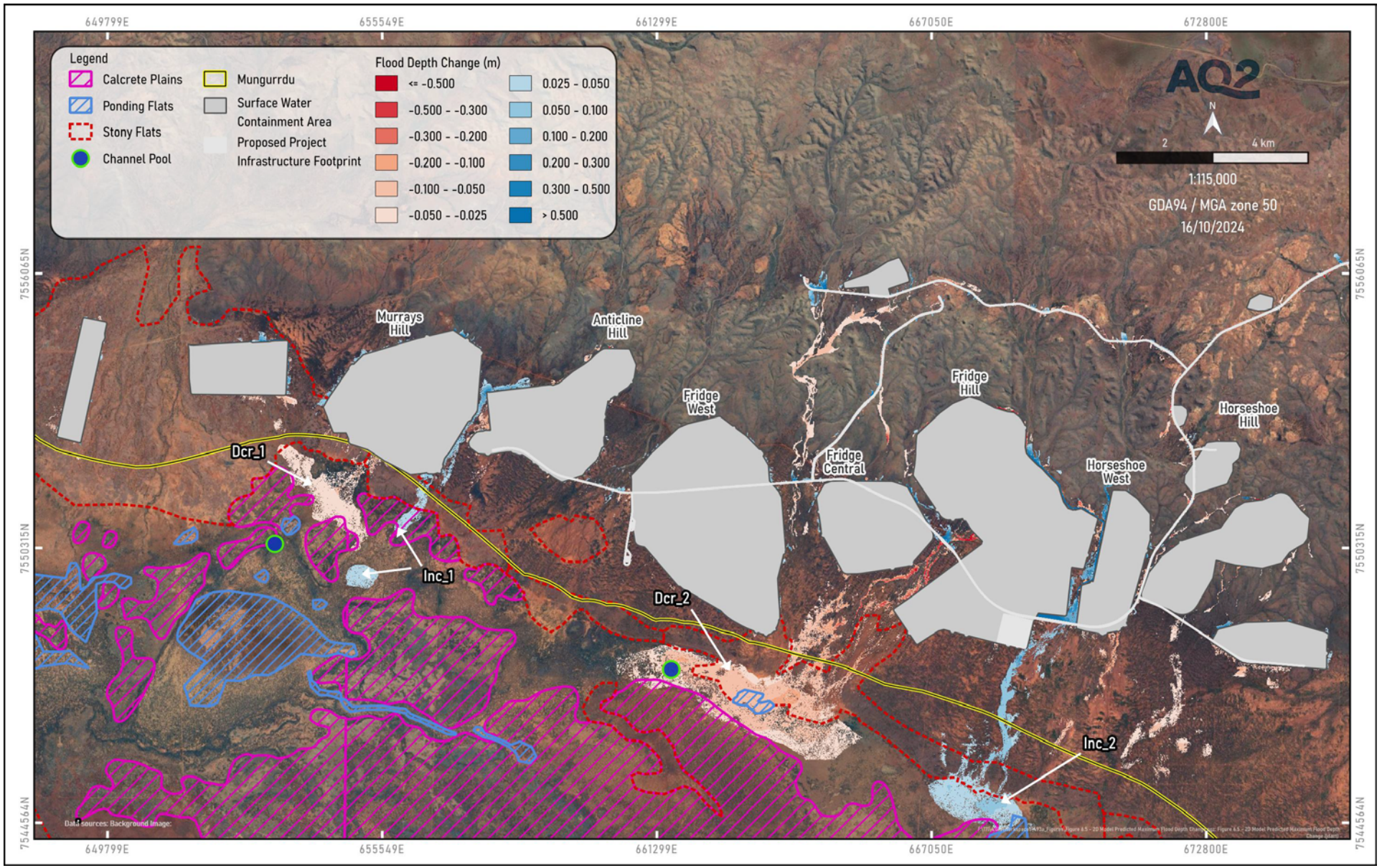



Figure 6.4 2D Model Predicted Maximum Flood Depth Change (LOM Minus Baseline)

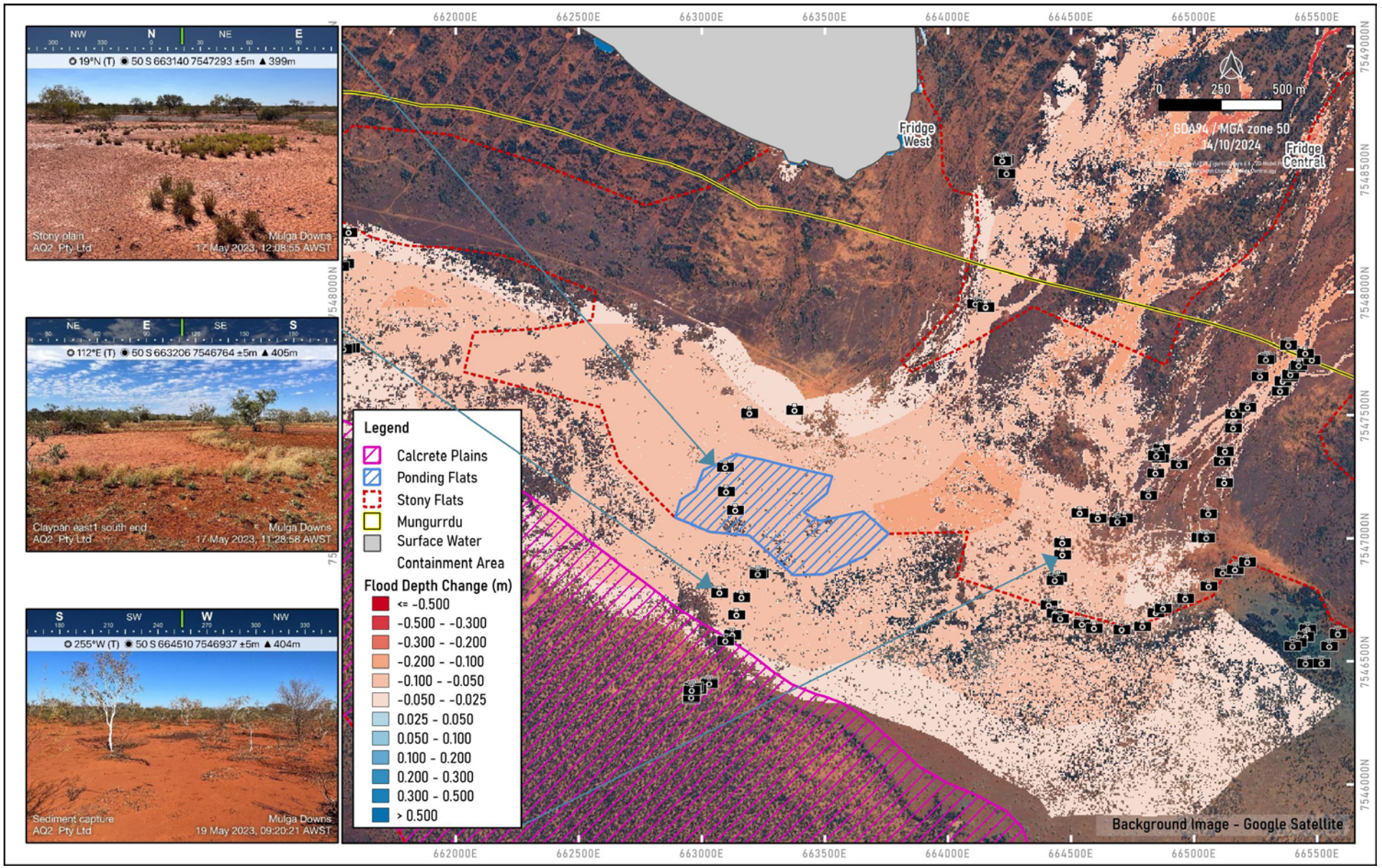



Figure 6.5 2D Model Predicted Maximum Flood Depth in Selected Ponding Zone

## 6.4 Significance of Groundwater and Surface Water Change

The potential impacts of hydrological change on mapped vegetation types and associated habitat attributes for MNES fauna species was qualitatively assessed, based on spatial interactions between these factors. This assessment took into account the DCCEEW Significant Impact Guidelines (Commonwealth of Australia 2013), which provide overarching guidance on determining whether an action is likely to have a significant impact on a matter protected under the EPBC Act. Figure 6.6 presents the records of conservation significant fauna with respect to the key areas where predicted groundwater and surface water change may impact vegetation. The findings of the assessment are summarised as follows:

- From ecohydrological studies conducted to date, the vegetation has been found to be disconnected from the groundwater system under baseline conditions, therefore a reduction in groundwater levels is not predicted to impact the terrestrial environment and associated habitats.
- Two areas have been identified as being at risk of exposure to shallow groundwater levels for periods of time, as a result of MAR in the Murray's Hill / Anticline Hill and Fridge / Horseshoe South areas. If groundwater mounds to above 2.0 mbgl, vegetation stress is predicted, however, no conservation significant fauna is recorded within these risk areas (refer Figure 6.6). Ongoing monitoring and adaptive management (i.e., redistribution of MAR) will avoid the impact of groundwater mounding on vegetation.
- A total area of approximately 25 ha is predicted to be subject to increased flood levels (>5 cm increase maximum flood height), comprising a mix of mulga dominated vegetation at the base of the alluvial fans and *E. victrix* woodlands proximal to an area of outcropping basement near the valley fringe. The magnitude of predicted change is modest. In the majority of cases, the dominant species in these vegetation types are well adapted to periodic flooding and drying and are unlikely to be significantly affected by the predicted hydrological change of increased surface water inputs. Vegetation types dominated by mulga (*Acacia aneura* complex) are susceptible to increased waterlogging, which could cause a decline in tree health. Such areas are relatively small in the overall affected area. Although this area has also been identified as being at risk of exposure to shallow groundwater levels (from MAR), as mentioned above, prolonged periods of groundwater mounding can be avoided with a programme of ongoing monitoring and adaptive management.
- A total area of approximately 310 ha is predicted to be subject to decreased flood levels (of >5 cm decrease maximum flood height). These areas largely comprise the Stony Flats EHU, which is blanketed in fine depositional sediments with patchy vegetation dominated mulga and scattered E. victrix in southern portions that transition into the Loamy Flats EHU. The magnitude of predicted change is modest. The dominant species in these vegetation types are well adapted to periodic flooding and drying and are unlikely to be significantly affected by the predicted hydrological change of decreased flood levels. Denser patches with high percentage cover of *E. victrix* (vegetation types AdEvWL and EvWL), have the greatest potential to experience soil water depletion and drought stress during prolonged interfloods.
- The vegetation types predicted to be exposed to hydrological change are widespread across the Fortescue Valley and do not contain critical habitat (as defined in Section 3.3) for EPBC listed threatened fauna species. Some instances of dense lignum thickets (relevant for the Night Parrot) occur further into the Fortescue Valley in association with *E. victrix* woodland communities, but these are distant from the areas potentially exposed to hydrological change.

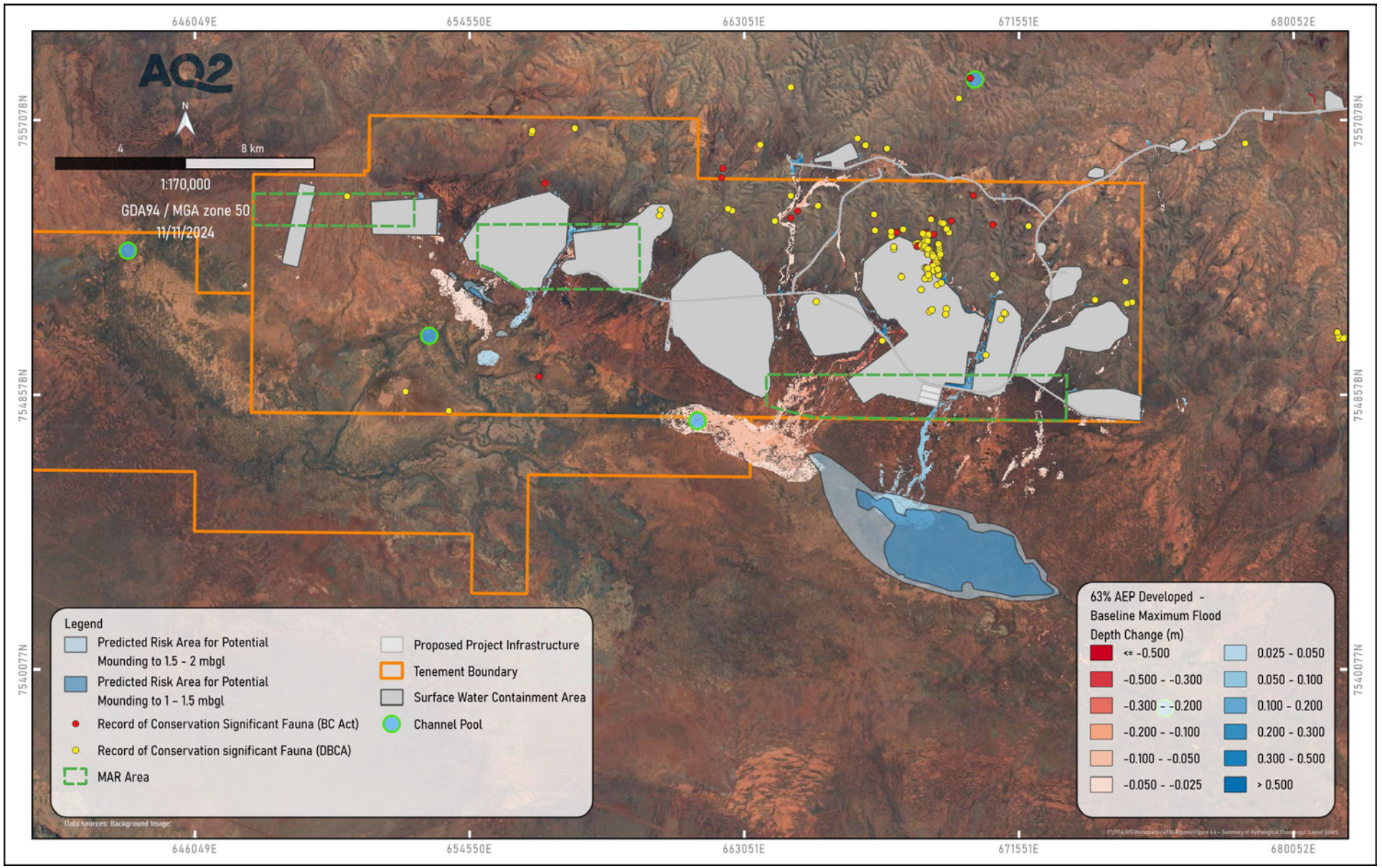



Figure 6.6 Summary of Groundwater and Surface Water Impact Areas with Respect to Conservation Significant Fauna

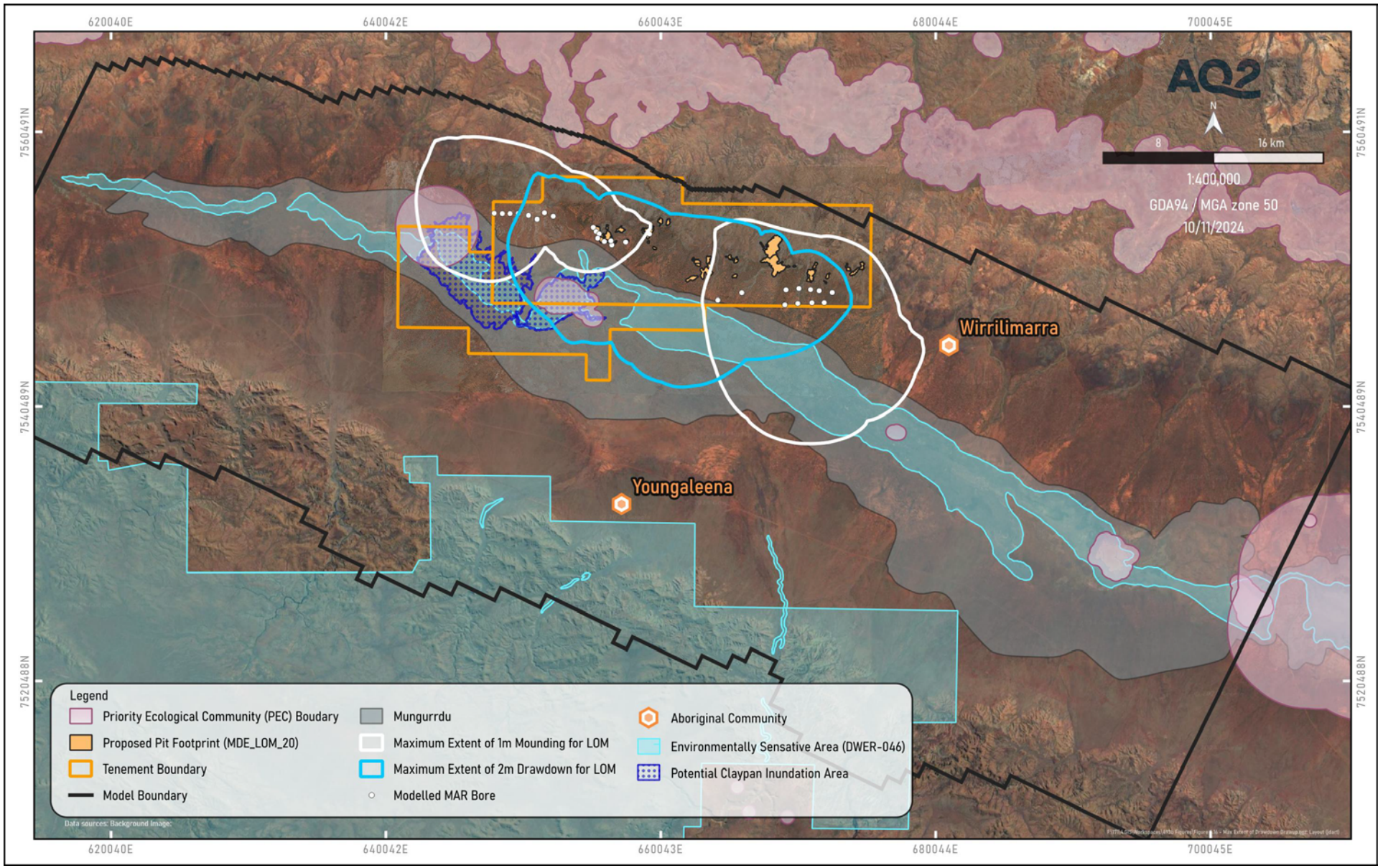



Figure 5.16 Maximum Extent of Predicted Drawdown and Mounding throughout LOM

# ATTACHMENT 5
# SUPPORTING DOCUMENT EXTRACTS FOR SUBMISSION RESPONSE 16

### 5.5.7 Post-Mining Impact Assessment

HanRoy intend to backfill the pits post-mining to above the pre-mining groundwater level. Modelling of the groundwater system at closure has been completed by GWC with details presented in Appendix F. Closure predictions for the backfilled pits were completed from the end of mining (June 2042) until predicted groundwater levels in the Mulga Downs area recovered to a final or equilibrium level.

Two backfill scenarios were simulated:

- The aquifer parameters for the infill material were the same as those assigned to the Undifferentiated Tertiary unit, based on the assumption that this unit would mostly likely make up the waste material. This was considered the base case closure scenario.
- The aquifer parameters of the infill waste were the same as the Marra Mamba Ore (i.e., the mined-out material), with higher permeability and storage values than the Undifferentiated Tertiary unit.

#### Groundwater Levels

Representative hydrographs showing the predicted recovery of groundwater levels for each mining area are presented in Figure 5.20 and Figure 5.21. "Backfill_Waste" refers to the predictions adopting Undifferentiated Tertiary parameters for the backfill and "Backfill_Insitu" refers to the predictions where Marra Mamba Ore parameters were adopted. There is negligible difference between the results of the two backfill scenarios.

It should be noted that the majority of groundwater level recovery has occurred prior to the commencement of the closure predictions (i.e., during the LOM), as the maximum depths of mining are reached approximately one year prior to the end of mining (refer Figure 5.3) and, as such, dewatering and MAR significantly reduces in the final year of mining (refer Figure 5.9). In particular, the western areas of Murray's Hill and Anticline Hill, which were mined (and dewatered) first and subsequently used for MAR have predicted water levels near to pre-mining water levels at the commencement of the closure prediction (refer Figure 5.20). As the Horseshoe South area is the last area used for MAR, groundwater levels in the nearby Horseshoe West mining area are recovering from mounding during the closure predictions (refer Figure 5.21).

The closure predictions show a rapid recovery of groundwater levels. GWC 2024 (Appendix F) reports that groundwater levels are predicted to recover to within 0.1 m of pre-mining levels, within 10 years of the cessation of mining, at all mining areas, MAR areas and regional simulated observation points (T1 to T18).

#### Groundwater Quality

The backfilling of the pits at the completion of mining eliminates any post-mining increases in groundwater salinity caused by evaporation from the pit lake surfaces.

No modelling of post-mining groundwater quality has been conducted to date, however, it is anticipated that the return of the groundwater salinity distribution to pre-mining conditions will take considerably longer (i.e., geological times scales) to achieve than the recovery of groundwater levels.

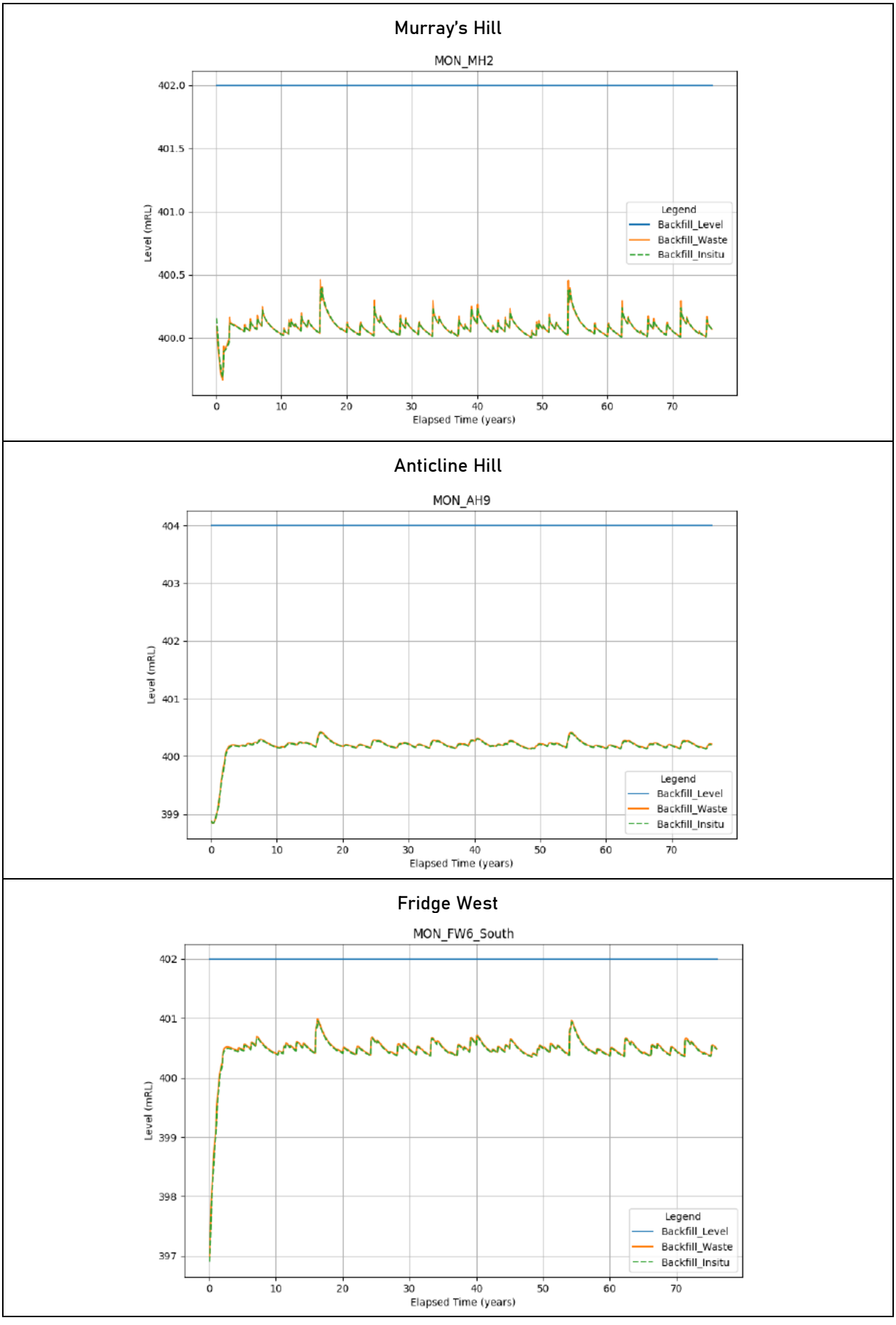



Figure 5.20 Predicted Groundwater Levels Post-Mining – Western Mining Areas (from GWC 2024)

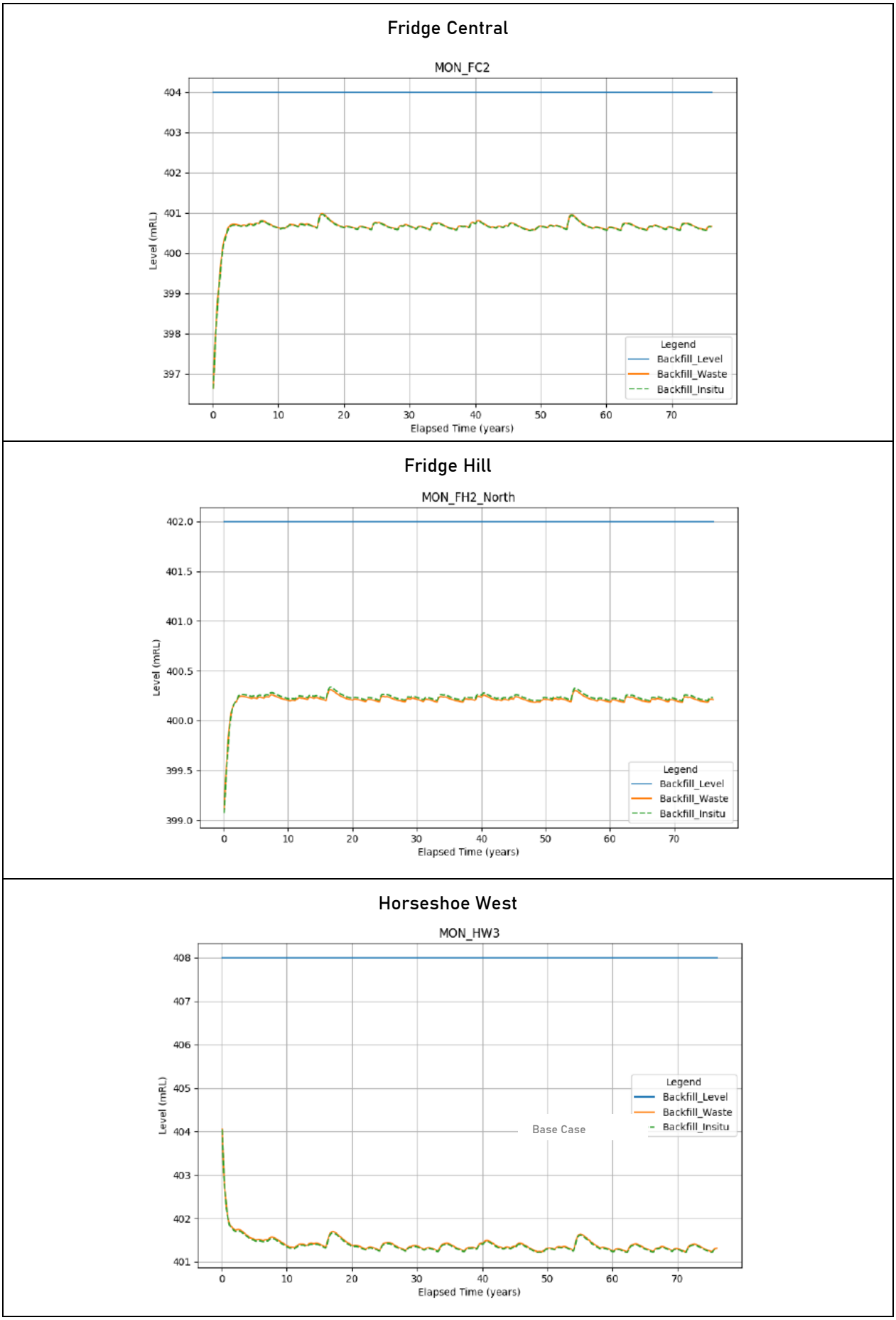



Figure 5.21 Predicted Groundwater Levels Post-Mining – Eastern Mining Areas (from GWC 2024)

Refer to Attachment 1 for relevant text from the baseline assessment report (Section 3.2 and 3.3 of AQ2 2025) and WMP (Table 3.4).

## 2. COMMENT 65

### 2.1 Comment

*"The project increasingly considers using infiltration pits as a Managed Aquifer Recharge (MAR) option for disposing of surplus water, in addition to MAR via reinjection. Limited information is available regarding infiltration efficiency and losses over time (e.g., due to siltation), losses from the hydrological system due to evaporation, and the impacts related to water quality issues, particularly concerns about salinity. The Banjima People have not been consulted about this management option."*

### 2.2 Response

In-pit infiltration does not necessarily have lower efficiency if the target aquifer is intersected by the pit and offers the benefit of targeted recharge to an area of storage depletion (due to dewatering). In particular, it should be noted that the current mine plan only includes several benches below the water table, therefore permeable ore will remain below the pit floor.

In-pit infiltration does not form the basecase surplus water disposal method at this time and will be subject to further evaluation and trials when the project is in development and operation.

HanRoy commit to no pit infiltration until further evaluation has been undertaken and suitable management strategies are devised.

## 3. COMMENT 66

### 3.1 Comment

*"Previously, HPPL acknowledged a certain level of uncertainty regarding the accuracy of their groundwater modelling. However, there no longer seems to be such an acknowledgement."*

### 3.2 Response

Although the main ERD document may not acknowledge the uncertainty of predictive groundwater modelling, the groundwater impact assessment documentation (AQ2 2024) includes:

- Model Uncertainty Assessment (Section 5.7.1).
- Model Uncertainty (Appendix E, Section 3.2).
- Model Limitations, Confidence, Assumptions and Recommendations (Appendix E, Section 3.3).

The report sections referred to above are provided in Attachment 2 of this document.

## 4. COMMENTS 67 & 68

### 4.1 Comment 67

*"HPPL has stated that there will be changes to the salinity of the groundwater as the MAR continues (specifically, the salinity will increase locally), but it has not provided a figure or map to illustrate the magnitude of the change. HPPL indicated that using salinity contours or isolines can be misleading. However, without a method for showing the magnitude and distribution of the change, it is impossible to assess what that change entails or how it may impact the local environment. Their comment implies that understanding the issue is unfeasible and appears to lack scientific basis."*

## 4.2 Comment 68

*"It remains unclear whether HPPL intends to model the long-term changes and recovery of water quality resulting from the abstraction and reinjection of saline water, apart from stating that recovery to the pre-mining state will take hundreds, if not thousands, of years (i.e., "geological timescales" AQ2 2024b) because the ERD contains contradictory statements. HPPL further claims that due to the "…small scale nature of the salinity change due to the project, it does not warrant complex assessment of salinity recovery." However, considering HPPL's inability to map the magnitude or distribution of salinity changes, it would be unreasonable to expect the Banjima People to take this at face value. This is important for the nearby communities of Youngaleena and Wirrilimarra to understand the risks to the groundwater where they live and use the water for domestic purposes. This will also impact stygofauna, and without a detailed understanding of the salinity changes, their distribution, and the length of time the changes persist, it will not be possible to assess the impacts on stygofauna.*

## 4.3 Response

The groundwater impact assessment documentation (AQ2 2024, Section 5.5.6) provides further details regarding the predicted changes to groundwater salinity resulting from the proposed dewatering and MAR; salinity hydrographs and flow paths (Figures 5.18 and 5.19 respectively of the impact assessment report) were used to demonstrate the extent of the predicted groundwater salinity changes based on base case predictions. Additional salinity hydrographs for sensitivity predictions are also presented in Appendix F (Groundwater Model Predictions) of the groundwater impact assessment report.

The figures and report sections referred to above are provided in Attachment 3 of this document.

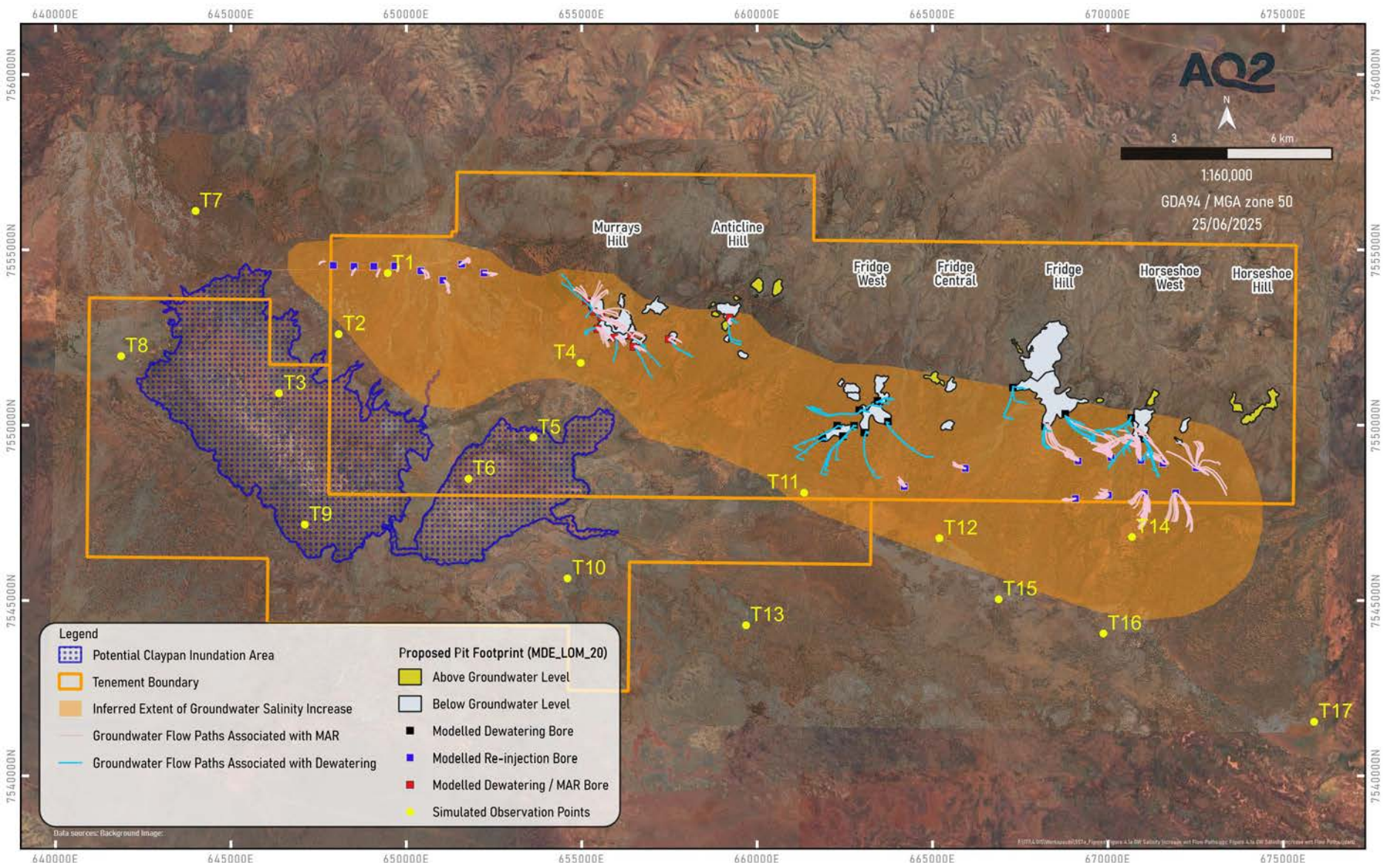
Figure 4.1 (below) has been prepared based on the previously reported information to better depict the modelled extent of groundwater salinity change. An area of potential groundwater salinity increase is presented in these figures, based on the following:

- Predicted salinity hydrographs, inclusive of sensitivity predictions.
- Predicted flow paths towards the modelled dewatering bores and away from the modelled MAR bores for the base case prediction.
- The predicted salinity of the reinjection water (predicted to range between 1,700 and 4,200 mg/L TDS) in comparison to the baseline salinity.

It is important to cross reference the area of predicted salinity increase with the baseline salinity distribution (refer Figure 4.1b). For example, the area of freshwater defined by the 1,000 uS/cm EC contour is approximately 25% of the total area of salinity increase. The baseline groundwater salinity naturally increases towards the centre of the valley (i.e., south of the MAR bores), therefore the magnitude of salinity increase resulting from reinjection diminishes with increasing proximity to the valley.

Figure 4.2 shows no predicted increase in groundwater salinity in the vicinity of Youngaleena and Wirrilimarra.

a) Inferred Extent with Predicted Flow Paths and Simulated Observation Points




b) Inferred Extent with Baseline EC Contours at Groundwater Level

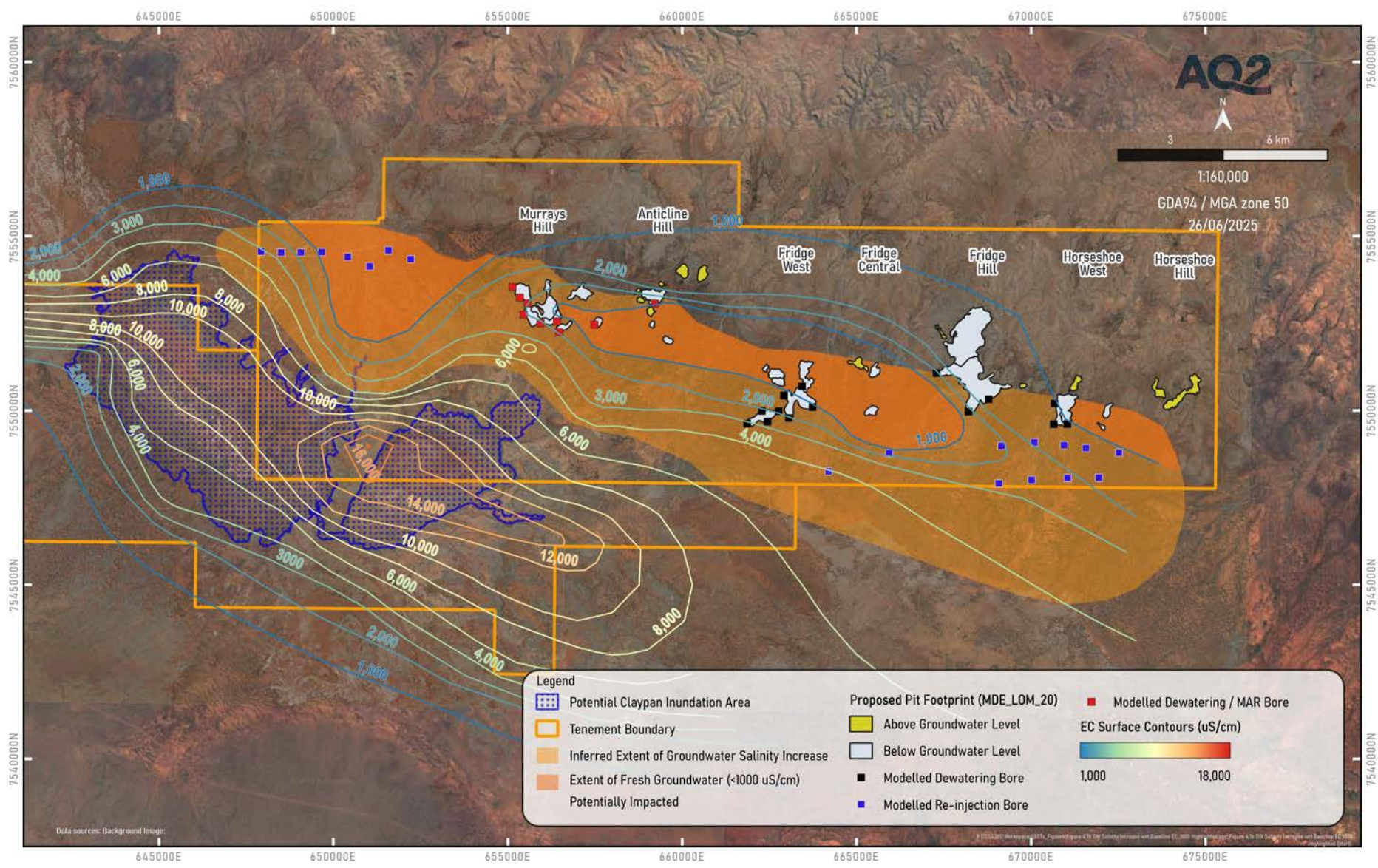



Figure 4.1 Inferred Extent of Groundwater Salinity Increase Based on Model Predictions

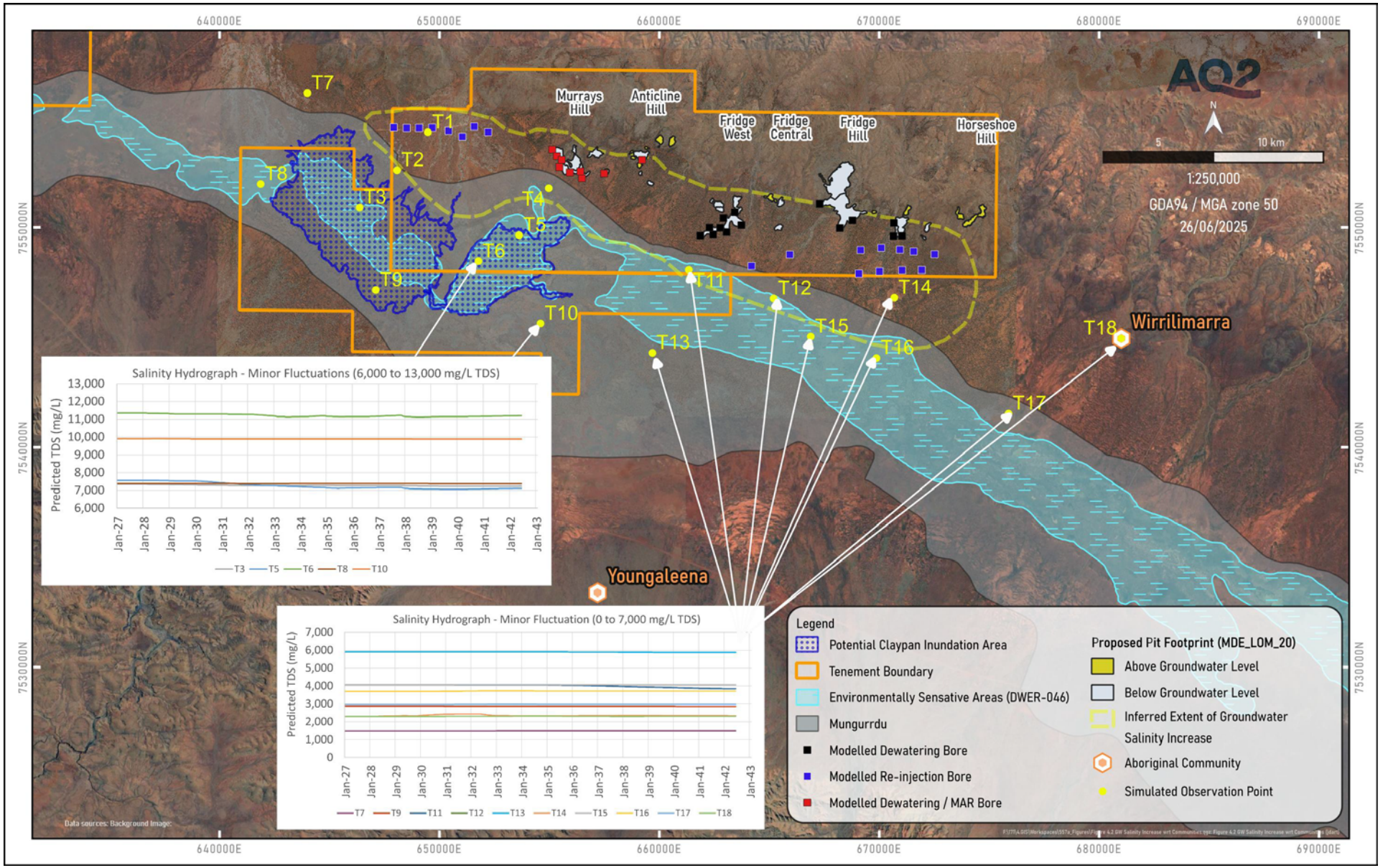



Figure 4.2 Inferred Extent of Groundwater Salinity Increase in Relation to Youngaleena and Wirrilimarra

Based on the modelling to date (inclusive of uncertainties) increases in groundwater salinity are anticipated to extend up to ~3.6 km from the modelled dewatering and MAR borefields.

As such, HPPL does not currently intend to model the long-term changes and recovery of water quality post-mining.

The potential impact on stygofauna has been addressed separately.

# 5. COMMENT 70

## 5.1 Comment

*"Concerns persist regarding the presumed continuous nature of the calcrete layer beneath which the saline groundwater is confined. Similar assumptions were made at another mining operation adjacent to the Fortescue Marsh about a clay layer thought to be continuous, preventing the mixing of reinjected saline water with the freshwater layer above it. Ultimately, water quality testing showed that the freshwater layer above the clay was indeed mixing with the reinjected saline water, as it was pushing up through openings in the clay layer (contrary to the previous assumption of continuity). HPPL's Proposed Action is based on a similar assumption, which may be incorrect and could significantly impact the local groundwater regime and the Freshwater Claypans of the Fortescue Valley PEC (P1). In the case of the currently operating example, the company now faces the challenge of sourcing an alternative freshwater supply for ore processing. It intends to construct a 100-km-long pipeline to secure a new supply of freshwater. The Banjima People are seriously concerned about the risks associated with the implementation of this Proposed Action."*

## 5.2 Response

Under baseline conditions, saline groundwater underlies the claypans (refer Section 6.6 of the baseline assessment report); at the water table the salinity of the groundwater in the vicinity of the claypans ranges between ~10,000 to 18,000 uS/cm EC (or ~7,000 to 13,000 mg/L TDS) and increases with depth.

The conceptual hydrogeological model for Mulga Downs does not include any regional confining units, therefore the saline groundwater is not confined. As detailed in Section 6.1.1 of the baseline assessment report (AQ2 2025):

- The Upper Calcrete has been identified as a permeable aquifer unit (although it acts as a barrier to plant / tree roots).
- Effectively, the Tertiary overburden forms a highly transmissive and continuous aquifer within the valley.
- Although clay units have been identified in some areas and may be locally confining, they have not been identified as extensive or continuous layers.

The potential groundwater-related risks to the Freshwater Claypans of the Fortescue Valley PEC (and to vegetation in the Project area in general) are associated with the mounding of groundwater resulting from MAR (refer Section 6.2 of the impact assessment report (AQ2 2024)). Without management, groundwater mounding could result in water logging of vegetation root zones (irrespective of the groundwater salinity).

The numerical groundwater model has been set-up to reflect the conceptual model and does not include confining units. The model predictions have shown that excess water can be reinjected whilst maintaining groundwater levels below the threshold criteria (i.e., the identified threshold groundwater depth above which interaction with vegetation may occur). Although the predicted depth to groundwater remains below this threshold in the immediate MAR areas throughout the LOM, areas to the south of both the Murray's Hill / Anticline Hill and Fridge / Horseshoe South MAR areas, at the break of slope, have been identified as