GOVERNMENT OF WESTERN AUSTRALIA

Environmental Protection Authority

Manuwarra Red Dog Highway – Revised Proposal

Commissioner of Main Roads Western Australia

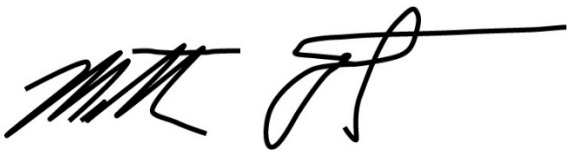
Report 1736

March 2023

This assessment report has been prepared by the Environmental Protection Authority (EPA) under s. 44 of the *Environmental Protection Act 1986* (WA). It describes the outcomes of the EPA's assessment of the Manuwarra Red Dog Highway – Revised Proposal by the Commissioner of Main Roads Western Australia.

This assessment report is for the Western Australian Minister for Environment and sets out:

- what the EPA considers to be the key environmental factors identified in the course of the assessment
- the EPA's recommendations as to whether or not the proposal may be implemented and, if it recommends that implementation be allowed, the conditions and procedures, if any, to which implementation should be subject
- other information, advice and recommendations as the EPA thinks fit.



Prof. Matthew Tonts
Chair
Environmental Protection Authority

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Summary

Proposal

The Manuwarra Red Dog Highway project was originally referred to the Environmental Protection Authority (EPA) in September 1998, as the 'New Road from Tom Price to Karratha' proposal. The proposal to construct stages 2, 3 and 4 of the project was approved in April 2005, subject to conditions set out in Ministerial statement 677 (the approved proposal).

Ministerial statement 677 authorised the construction and maintenance of a new road from the North West Coastal Highway, near Karratha, to the Nanutarra-Munjina Road, north of Tom Price, in the Pilbara region of Western Australia. The road of approximately 245 kilometres (km) in length, traverses the Millstream-Chichester National Park.

The approved proposal comprised 3 stages, being stages 2, 3 and 4. Stage 1 was completed in 2003 and was not referred to the EPA for assessment. The Construction of stages 2 and 3 were completed in 2008 and 2020 respectively, in accordance with Ministerial statement 677. Figure 1 shows the location of stages 2 and 3 and the yet to be constructed (proposed) stage 4. The stage 4 development envelope (development envelope) is shown in Figure 2.

During the construction of stage 3, the proponent identified the authorised extent of disturbance under the approved proposal was insufficient to complete stage 4 of the highway. This is due to (Jacobs 2022a):

- changes in road design standards since 2005
- community expectations regarding safety of regional roads
- modifications to the alignment of stage 4 resulting from stakeholder engagement.

The Manuwarra Red Dog Highway – Revised Proposal (the proposal) is for a significant amendment to the approved proposal, to enable completion of stage 4 to:

- increase the length of the highway by around 6 km
- increase the disturbance extent by an additional 657 hectares (ha) within the stage 4 development envelope of 7,142 ha, of which 100 ha comprises disturbance for temporary purposes and will be revegetated following construction
- realign the stage 4 section to be as close as possible to, and entirely on the western side of, the existing Pilbara Rail Company (Rio Tinto) rail line.

The EPA has considered that the significant amendment includes a direct disturbance footprint of more than double the area that was initially applied for, noting that Ministerial statement 677 originally approved 574 ha and now an additional 657 ha (including 646 ha in a 'Good' or better condition) is being sought. The EPA recommends condition B1 to mitigate the potential for additional

disturbance in the future, by requiring final disturbance footprint plans which are consistent with the recommended maximum clearing extents, prior to construction.

Stages 2, 3 (both completed), and 4 (proposed) are shown in Figure 1.

The proponent is the Commissioner of Main Roads Western Australia.

Environmental values

Flora and vegetation, terrestrial fauna, inland waters, and social surroundings are the key environmental factors that may be impacted by the proposal.

Consultation

The EPA published the proponent's referral information for the proposal on its website for 7 days public comment. The EPA also published the proponent's additional information, being the environmental review document (Jacobs 2022a) on its website for public review for 4 weeks (from 8 August 2022 to 5 September 2022). No public comments were received during the public review period.

Mitigation hierarchy

The mitigation hierarchy is a sequence of proposed actions to reduce adverse environmental impacts. The sequence commences with avoidance, then moves to minimisation, rehabilitation, and offsets are considered as the last step in the sequence.

The proponent considered the mitigation hierarchy in the development and assessment of its proposal (Jacobs 2022a; Jacobs 2022c), and as a result will:

- avoid an Aboriginal site of significance (heritage restriction zone - HRZ_01)
- avoid the temporary clearing of areas of threatened ecological communities (TEC) and priority ecological communities (PEC), northern quoll (*Dasyurus hallucatus*) critical and supporting habitat, and priority flora
- avoid direct impact to 16 (out of 19 recorded) priority flora species recorded in the development envelope, including all priority 1 and priority 2 species
- minimise direct impacts to conservation significant ecological communities, priority flora, and significant vegetation and fauna habitat types through road alignment development
- minimise clearing of native vegetation by using existing cleared areas where practicable, through road design, and by using safety barriers and steepened batters where possible to reduce road width
- minimise fragmentation through alignment of stage 4 as close as possible with the existing Rio Tinto rail line
- minimise direct disturbance to threatened and priority ecological communities and locally significant vegetation types, and important fauna habitat types through setting limits of disturbance

- minimise impact to terrestrial fauna by undertaking pre-clearance surveys, engage in displacement methods for western pebble mound mouse (*Pseudomys chapmani*), implement vehicle speed limits, limit the timing of disturbance within critical quoll habitat (outside of the pouched/denned young period), and set activity buffers around potential ghost bat (*Macroderma gigas*) roost caves
- minimise the risk of impact to existing hydrological regimes by ensuring the road alignment matches the direction of natural flow, and incorporating appropriate waterway crossings and culverts into the final road design
- progressively revegetate all temporary cleared areas post construction, comprising 100 ha.

The EPA acknowledges the proponent's efforts to align stage 4 of the proposal as close as possible to the existing Rio Tinto rail line, to reduce fragmentation of native vegetation. The EPA also expects that completion of the highway will avoid unnecessary future infrastructure which would further fragment native vegetation.

Residual impacts are those that remain after the mitigation hierarchy has been applied. The residual impacts of the proposal for the relevant key environmental factors are outlined below.

Assessment of key environmental factors

The EPA has identified the key environmental factors (listed below) during the assessment. For each factor, the EPA has assessed the residual impacts of the proposal on the environmental values and considered whether the environmental outcomes are likely to be consistent with the EPA environmental factor objectives.

As the proposal is a significant amendment to an approved proposal, the EPA's assessment has been undertaken in the context of the approved proposal, having regard to the combined and cumulative effects on the environment. The EPA has also considered whether to inquire into the implementation conditions for the approved proposal.

Flora and vegetation

Residual impact or risk to environmental value	Assessment finding
Proposal (significant amendment) Clearing of 646 ha of native vegetation in 'Good to Excellent' condition, which includes locally significant vegetation communities comprising potentially groundwater dependant vegetation, vegetation communities on cracking clays and grove-intergrove Mulga communities. Combined effect of stages 2 and 3	The proposal is within the Pilbara Bioregion, and stretches across the Fortescue, Hamersley and Chichester Pilbara sub-regions. The EPA advises that the clearing of 'Good' to 'Excellent' condition vegetation, which includes locally significant vegetation communities, is significant in the context of biological diversity and ecological integrity, as it provides habitat for conservation significant flora and fauna species.

Stages 2 and 3 involved the clearing of around 505 ha, including 137 ha of temporary clearing required for rehabilitation by Ministerial statement 677. The extent of this vegetation in a 'Good' to 'Excellent' condition was not quantified. Precautionarily assuming that all vegetation in stages 2 and 3 was in 'Good' to 'Excellent' condition, the combined effect of stages 2 and 3 with the current proposal is the loss of 1,151 ha of vegetation in a 'Good' to 'Excellent' condition. There was 28.47 ha of potential groundwater dependent vegetation (GDV) impacted under Stages 2 and 3. The combined effect on potential GDV is 48.57 ha. The extent of impact to vegetation communities on cracking clays and grove-intergrove Mulga communities was not quantified for stages 2 and 3.	The EPA advises that this residual impact should be subject to conditions (recommended conditions A1, B2 and B6) to require maximum clearing extents for vegetation in a 'Good' or better condition, and locally significant vegetation communities, and a contribution to the Pilbara Environmental Offsets Fund to counterbalance the significant residual impact. This ensures consistency with the EPA objective for flora and vegetation.
<u>Proposal</u> Clearing of the following conservation significant ecological communities: • 15 ha of the Themeda grasslands TEC • 12 ha of the Brockman Iron PEC. <u>Combined effect</u> No clearing of the Themeda grasslands TEC or Brockman Iron PEC was required for stages 2 or 3 of the project. Stage 4 of the approved proposal, none of which has been constructed to date, included the clearing of 17.5 ha of Themeda grasslands TEC, this has been reduced to 15 ha for the revised stage 4. There was no reference to Brockman Iron PEC impacts from stage 4 under Ministerial Statement 677. However, the stage 4 alignment of the approved proposal intersected the mapped occurrence of the PEC and would likely have impacted this community should it have progressed and been implemented.	The EPA advises that the proposed clearing of 15 ha of the Themeda grasslands TEC and 12 ha of the Brockman Iron PEC are significant residual impacts. The EPA advises that these significant residual impacts should be subject to conditions (recommended conditions B2 and B6) to require maximum clearing extents for the TEC and PEC and offsets to counterbalance the significant residual impacts to these communities. This ensures consistency with the EPA objective for flora and vegetation.
<u>Proposal</u> Clearing of a small portion (relative to the recorded extent in the development	The EPA advises that the proposed impact to the 3 priority flora species is unlikely to constitute a significant residual impact. This

envelope) of total recorded individuals of the following three priority flora species (Priority 3): • *Euphorbia australis* var. *glabra* • *Glycine falcata* • *Themeda* sp. Hamersley Station (M.E. Trudgen 11431). <u>Combined effect</u> The above priority flora species were not identified within the stage 2 and 3 development area. *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) was recorded within stage 4 of the approved proposal, noting that it is a dominant species within the Themeda grasslands TEC. The extent of impact was not quantified, however, noting that the current proposal identifies a lesser extent of impact to the Themeda grasslands TEC, it is likely that there will be a lesser impact to *Themeda* sp. Hamersley Station (M.E. Trudgen 11431).	is noting that the project is unlikely to impact on their conservation status or impact significantly on their regional or local extent. This is based on the extent of impact proposed and number and distribution of known occurrences within and outside the development envelope. The EPA has concluded that the environmental outcome is consistent with the EPA's objective for flora and vegetation.
<u>Proposal</u> Indirect impacts associated with the introduction and spread of weeds, dust emissions, fragmentation, groundwater drawdown and altered hydrological regimes. <u>Combined effect</u> Not expected to be significant given the long linear infrastructure, hydrological nature of the area, that abstraction activities have ceased for stages 2 and 3 and that ongoing management of post construction indirect impacts for stage 3 is required by the vegetation protection and rehabilitation, surface drainage, national park and weed control management plans.	The EPA advises that these residual impacts are not likely to be significant subject to recommended conditions (B2) requiring no adverse impacts to conservation and locally significant vegetation communities, and a management plan to demonstrate how achievement of no adverse impacts will be monitored and substantiated. The EPA also recommends condition B2-4 and B7 to require ongoing weed control and management (kapok and ruby dock) within 50 m of the road (relevant to stages 2 and 3 only) in the Millstream-Chichester National Park and continued implementation (monitoring and remediation if necessary) of the previously approved stage 3 management plans that contain ongoing post-construction monitoring requirements. These conditions would ensure consistency with the EPA objective for flora and vegetation.

Terrestrial fauna

Residual impact or risk to environmental value	Assessment finding
Proposal Direct impact to the following habitat types that are of importance to threatened fauna: • 0.15 ha of mesas, caves, cliffs and free faces (HS) habitat type • 3.85 ha of rocky gullies (RG) habitat type • 86.7 ha of rocky hills and slopes with low spinifex and scattered trees (RHS) habitat type • 90.4 ha of Eucalyptus fringed major drainage lines and associated tributaries (MDE) habitat type • 0.03 ha of Melaleuca Forest/major drainage lines (MDM) habitat type • 183.3 ha of Floodplains (CP) habitat type. Combined effect • No critical habitat for northern quoll was impacted under stages 2 and 3 • 48.1 ha of supporting habitat for northern quoll and Pilbara leaf-nosed bat was impacted under stages 2 and 3 • 64.2 ha of ghost bat and Pilbara olive python supporting habitat was impacted under stages 2 and 3. Given the above, the combined impact on each species habitat is: • 229.25 ha of habitat for northern quoll, including 46.3 ha of critical habitat • 229.25 ha of supporting habitat for Pilbara leaf-nosed bat • 380.35 ha of supporting habitat for Pilbara olive python • 380.55 ha of habitat for ghost bat including 154.4 ha of critical habitat	The EPA considers that these fauna habitat types provide critical habitat and supporting habitat for the threatened northern quoll and ghost bat and supporting habitat for the threatened Pilbara leaf-nosed bat and Pilbara olive python. The EPA has assessed that the proposed impact to these fauna habitats is a significant residual impact. The EPA advises that the significant residual impact should be subject to conditions (recommended conditions B3 and B6) to require fauna habitat clearing extent limitations and a contribution to the Pilbara Environmental Offsets Fund to counterbalance the significant residual impacts to fauna habitat. This ensures consistency with the EPA objective for terrestrial fauna.

Proposal Impact to threatened fauna through vehicle strike and fence collision. Combined effect The combined effect with stages 2 and 3 for this impact is unlikely to be significant noting the distance that the linear road infrastructure extends over and expected relatively low traffic volumes.	The EPA advises that this residual impact is not likely to be significant subject to recommended conditions (B3) to require construction vehicle speed limits, pre-clearance northern quoll and grey falcon surveys, no clearing at night within northern quoll critical habitat, no clearing during northern quoll breeding season in suitable denning habitat, northern quoll signage, and specifications for barbed wire fencing (including requirement for bat deflectors). This ensures consistency with the EPA objective for terrestrial fauna.
Proposal Indirect impact to ghost bat habitat through vibration, noise emissions and artificial light. Indirect impact to northern quoll through artificial light and habitat fragmentation. Combined effect Noting that no ghost bat roost caves, Pilbara leaf-nosed bat roost caves, or northern quoll critical habitat was identified within the development envelope of stages 2 and 3, the combined effect of this impact is not likely to be significant.	The EPA advises that this residual impact is not likely to be significant subject to recommended conditions (B3) requiring no construction activities within 200 m of ghost bat caves, no blasting during day-time hours, an environmental management plan to ensure no adverse impacts to ghost bats should blasting be required within between 200 m and 500 m of ghost bat caves and permanent and artificial lighting restrictions. The EPA has considered the proponent's advice regarding a recent study indicating frequent use of culverts by northern quoll as a road underpass, which limits fragmentation. The EPA understands that culverts will be installed throughout the alignment. The EPA's above recommended conditions would ensure consistency with the EPA objective for terrestrial fauna.

Inland waters

Residual impact or risk to environmental value	Assessment finding
Proposal Changes to surface water flows from the presence of the road. Combined effect Not expected to be significant given the long linear infrastructure proposed and hydrological nature of the area, noting that the overall project passes through the Harding River Catchment (stage 2), Fortescue River Catchment (stages 2 and 3) and Ashburton River Catchment (stage 4).	The EPA has assessed that changes to existing surface water flows has the potential to indirectly impact significant environmental values of the local area, including conservation and locally significant vegetation communities and major watercourses. The EPA advises that this residual impact should be subject to conditions (recommended conditions B2, B4 and B7) to require no adverse impacts to sensitive environmental values or surface water flows within Weelamurra Creek, Caves Creek and Barnett Creek (or associated major

	drainage lines), a management plan to demonstrate how achievement of no adverse impacts will be monitored and substantiated, and continued implementation (monitoring and remediation if necessary) of the approved surface drainage management plan for stage 3. This ensures consistency with the EPA objective for inland waters.
Proposal Potential impact to water quality. Combined effect Not expected to be significant given the long linear infrastructure proposed and hydrological nature of the area.	The EPA has assessed that construction works could result in increased sedimentation, and/or erosion to the banks of watercourses being intersected by the proposal, leading to a decline in surface water quality. The EPA considers that the risk of groundwater contamination through hydrocarbons or hazardous material spills is minimal. The EPA advises that the residual impact to surface water quality should be subject to conditions (recommended condition B4) to require no adverse impacts to surface water quality within Weelamurra Creek, Caves Creek and Barnett Creek (or associated major drainage lines) or to permanent or semi-permanent pools of Weelamurra Creek, a management plan to demonstrate how achievement of no adverse impacts will be monitored and substantiated, and continued implementation (monitoring and remediation if necessary) of the approved surface drainage management plan for stage 3. This ensures consistency with the EPA objective for inland waters.
Proposal Groundwater drawdown from abstraction and dewatering during construction. Combined effect Not likely to be significant given the works for stages 2 and 3 have been completed and will not require ongoing groundwater abstraction.	The EPA has assessed that impacts to groundwater levels are likely to be temporary during construction only. The EPA advises that this residual impact should be subject to conditions (recommended condition B2) to require no adverse impacts to environmentally sensitive values and to permanent or semi-permanent pools of Weelamurra Creek. The EPA has considered that abstraction will be subject to regulation under the *Rights in Water and Irrigation Act 1914* (RIWI). The above recommended condition and regulation under the RIWI Act will ensure consistency with the EPA objective for inland waters.

Social surroundings

Residual impact or risk to environmental value	Assessment finding
Proposal Potential for direct or indirect impact to Aboriginal heritage sites and areas of cultural significance. Combined effect Stages 2 and 3 occurred within Yindjibarndi country. Ministerial Statement 677 required preparation and implementation of an Aboriginal Heritage management plan (AHMP). The AHMP (latest version 2018) noted that 17 Aboriginal Sites or places of significance were identified within the development envelope of Stages 2 and 3. The Yindjibarndi representatives provided consent for the proponent to undertake the proposed development of stages 2 and 3.	The EPA advises that there is a risk of adverse impacts to Aboriginal cultural heritage. The EPA advises that this residual impact should be subject to conditions (recommended condition B5) to require the proponent to update the existing Yindjibarndi country AHMP and prepare and implement a Wintawari Guruma country AHMP with input from the Yindjibarndi People and Wintawari Guruma People Traditional Owners respectively. Recommended condition B5 would also require no interruption of ongoing access to important lands, avoidance of a heritage restriction zone, ongoing consultation regarding minimising impacts to the Four Mile site and avoid and/or minimise direct disturbance to significant sites. These conditions will ensure consistency with the EPA objective for social surroundings.

Holistic assessment

The EPA considered the connections and interactions between relevant environmental factors and values to inform a holistic view of impacts to the whole environment. The EPA formed the view that the holistic impacts would not alter the EPA's conclusions about consistency with the EPA factor objectives.

Conclusion and recommendations

The EPA has taken the following into account in its assessment of the proposal:

- environmental values which may be significantly affected by the proposal
- assessment of key environmental factors, separately and holistically (this has included considering cumulative impacts of the proposal where relevant)
- likely environmental outcomes which can be achieved through conditions
- consistency of environmental outcomes with the EPA's objectives for the key environmental factors
- EPA's confidence in the proponent's proposed mitigation measures
- whether other statutory decision-making processes can mitigate the potential impacts of the proposal on the environment
- principles of the *Environmental Protection Act 1986* (EP Act).

The EPA has recommended that the proposal may be implemented subject to conditions recommended in Appendix A.

1 Proposal

The road now known as the Manuwarra Red Dog Highway, was originally referred to the EPA in September 1998, as the Road from Tom Price to Karratha proposal. The proposal to construct stages 2, 3 and 4 of the project was approved subject to conditions set out in Ministerial Statement 677 in April 2005 (the approved proposal).

Ministerial Statement 677 authorised the construction and maintenance of a new sealed road from the North West Coastal Highway, near Karratha, to the Nanutarra-Munjina Road, north of Tom Price, in the Pilbara region of Western Australia. Ministerial Statement 677 authorised a total area of disturbance of 574 ha, of which 137 ha comprised of temporary disturbance areas required for rehabilitation.

The approved proposal involved constructing the road in 3 stages (see Figure 1), including:

- stage 2: a 93 km section from the North West Coastal Highway near Karratha to approximately 20 km north of the Millstream turn-off on the existing Roebourne-Wittenoom Road (includes a section within Millstream-Chichester National Park – see Figure 1).
- stage 3: a 46 km section in common with the existing Roebourne-Wittenoom Road (includes a section within Millstream-Chichester National Park).
- stage 4: a 112 km section from Wallyinya Pool (on the existing Roebourne-Wittenoom Road) to the Nanutarra-Munjina Road adjacent to the existing Pilbara Rail Company railway (Jacobs 2020) (occurs outside of Millstream-Chichester National Park).

Stage 1 of the Manuwarra Red Dog Highway was completed in 2003. Stage 1 was not referred to the EPA for assessment.

Since the approval of the proposal, 2 changes have been made to Ministerial Statement 677, including:

- change to implementation condition 7-2 to increase the amount of clearing within the Millstream-Chichester National Park from ‘not more than 100 ha’ to ‘not more than 145 ha’
- change to the authorised extent of physical and operational elements by:
    - combining the authorised extent of disturbance for ‘road formation’ and ‘material sources’
    - removing proposal characteristics that were no longer considered to be key proposal characteristics, being ‘design speed’ and ‘railway crossings’.

Construction of stages 2 and 3 were completed in 2008 and 2020 respectively, and in accordance with Ministerial Statement 677. During the construction of stage 3, the proponent identified that the authorised extent of disturbance under the approved proposal was insufficient to complete stage 4 of the highway.

Changes in road design standards since 2005, community expectations regarding safety of regional roads, and modifications to the alignment of stage 4 resulting from stakeholder engagement, have influenced the required increase in the extent of disturbance to complete all stages of the proposal (Jacobs 2022a).

Therefore, the Manuwarra Red Dog Highway – Revised Proposal (the proposal) is for a significant amendment to the approved proposal, to enable completion of stage 4 to:

- increase the length of the highway by around 6 km
- increase the disturbance extent by an additional 657 ha within the stage 4 development envelope (development envelope – see Figure 2) of 7,142 ha, of which 100 ha comprises disturbance for temporary purposes and will be revegetated following construction
- realign stage 4 to be entirely on the western side of the existing Pilbara Rail Company (Rio Tinto) rail line.

When combined with the disturbance authorised by Ministerial Statement 677, the proposed disturbance extent of the proposal is 1,231 ha. Noting stages 2 and 3 are complete, no amendments are proposed to these sections of the approved proposal. Some conditions of Ministerial Statement 677, regarding weed control in Millstream-Chichester National Park and the implementation of management plans, are still relevant to the proposal and will be included in a new Ministerial Statement, which will supersede Ministerial Statement 677, if the proposal is approved for implementation.

Noting that stages 2 and 3 have been completed, further reference in this report to “proposed impacts” are in specific reference to those impacts associated with the proposed stage 4 (being the significant amendment).

The proponent for the proposal is the Commissioner of Main Roads Western Australia.

The proponent referred the proposal to the EPA on 11 October 2020. The referral information was published on the EPA website for 7 days public comment between 1 December and 7 December 2020. On 16 December 2020, the EPA decided to assess the proposal at the level Referral Information with addition information required (4-week public review). The EPA published the additional information, being an environmental review document (Jacobs 2022a), on its website for public review between 8 August and 5 September 2022.

The proposal was determined under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) to be a controlled action by the Department of Climate Change, Energy, the Environment and Water (DCCEW) (reference EPBC 2020/8725). DCCEW approved the proposal on 24 January 2023. The proposal has not been assessed by the EPA as an accredited assessment under the EPBC Act. However, the EPA has had regard to issues relevant to Matters of National Environmental Significance in its assessment.

The elements of the proposal which have been subject to the EPA's assessment are included in Table 1. The EPA has assessed the residual impacts of the proposal by considering the expansions and changes which are now proposed in the context of the approved proposal. The EPA has also considered the combined impacts of the approved proposal and the proposed changes, and cumulative impacts of the proposal with other proposals in the region. The EPA has not re-assessed the approved proposal.

Table 1: Location and proposed extent of proposal elements (Main Roads WA 2022a)

Proposal element	Location	Approved proposal (MS 677)[1]	Significant amendment	Combined proposal
Physical elements				
Road length	Figure 1	Approximately 245 km.	Increase in length by approximately 6 km	Approximately 251 km
Area of Disturbance	Figure 1	Clearing and disturbance of no more than 574 ha, which includes 137 ha of temporary clearing that will be rehabilitated following construction of the road formation.	Additional clearing and disturbance of no more than 657 ha within a development envelope of 7,142 ha located within the stage 4 section. The 657 ha proposed for clearing includes 100 ha of temporary clearing that will be revegetated following construction of the road formation.	Clearing and disturbance of no more than 1,231 ha of which no less than 237 ha will be rehabilitated following construction of the road formation. All clearing and disturbance for stage 4 of the revised proposal is to occur within a development envelope of 7,142 ha.
Formation width	-	Approximately 9 m.	The proposed road formation width is now 12 m.	
Waterway crossings	Figure 1	Up to 9 bridges across major watercourses and railway lines. Culverts and low-level floodways will be used for all other waterway crossings.	No change.	Up to 9 bridges across major watercourses and railway lines. Culverts and low-level floodways will be used for all other waterway crossings.
Fencing of road reserve	Figure 2 and 3	Approximately 200 km of fence will be	No change.	Approximately 200 km of fence will be

Proposal element	Location	Approved proposal (MS 677)[1]	Significant amendment	Combined proposal
		erected along the road reserve outside the Millstream-Chichester National Park.		erected along the road reserve outside the Millstream-Chichester National Park.
Proposal elements with greenhouse gas (GHG) emissions				
Construction elements				
Scope	GHG emissions estimates			
Scope 1:	Total of 108,154 tCO_{2-e} for stage 4 over 30-month construction period (43,262 tCO_{2-e} per annum) comprising: • construction fuel consumption: 51,735 tCO_{2-e} • vegetation clearance: 56,419 tCO_{2-e}.			
Scope 2:	No scope 2 emissions.			
Scope 3:	Total of 91,984 tCO_{2-e} for stage 4 comprising: • supply of construction fuel: 2,673 tCO_{2-e} • supply of construction materials: 79,415 tCO_{2-e} • associated haulage: 9,896 tCO_{2-e}.			
Operation elements				
Scope	GHG emissions estimates			
Scope 1:	Total of 69,435 tCO_{2-e} for maintenance of stages 2,3 and 4 (50-year life).			
Scope 2:	No scope 2 emissions.			
Scope 3:	Total of 2,719,097 tCO_{2-e} for stages 2,3 and 4 comprising: • supply of maintenance materials (50-year life): 16,806 tCO_{2-e} • road users (50-year life): 2,702,291 tCO_{2-e}.			

[1] Since approval of the approved proposal in April 2005, 2 minor changes to the Proposal Key Characteristics have been approved via the section 45C process being creation of a total area of disturbance of 574 ha by combining the 2 areas of disturbance described in the approved proposal; and removal of elements no longer considered key characteristics for the purposes of environmental approval (i.e. design speed and railway crossings). The previous section 45C process did not remove formation width and connections to existing roads.

[2] Road connections are no longer considered a key characteristic for the purposes of environmental approval as this area is accounted for in the Proposal Element "Area of disturbance".

[3] No development envelope is defined in the original approved proposal.

[4] Formation width is no longer considered a key characteristic for the purposes of environmental approval as this area is accounted for in the Proposal Element "Area of disturbance".

Units and abbreviations

ha – hectare
km – kilometre
tCO_{2-e} – tonnes of carbon dioxide equivalent

Application of *Environmental Protection Act 1986* amendments to the proposal

The proposed changes were initially referred to the EPA on 13 October 2020 as a revised proposal to the approved proposal under Ministerial Statement 677. The EPA decided to assess the proposal on 21 December 2020.

The EP Act was subsequently amended on 22 October 2021, and one result of the amendments is that the proposal is now considered to be a significant amendment to the approved proposal.

Given the proposal is a significant amendment to an approved proposal, the EPA's assessment has been undertaken in the context of the approved proposal, having regard to the combined and cumulative effects on the environment. The EPA has also considered whether to inquire into the implementation conditions for the approved proposal.

The EPA has not re-assessed the approved proposal (Ministerial Statement 677).

Proposal amendments

The proposal is set out in section 2 of the referral supporting document (Jacobs 2020), which is available on the EPA website.

The proponent requested changes to the proposal during the assessment to:

- reduce the amount of clearing required from 800 ha to 657 ha
- change the indicative disturbance footprint, increasing the road length by 6 km.

The amendment results in the following reduction in residual impacts:

- the permanent clearing of native vegetation from 700 ha to 557 ha
- the clearing of the Themeda grasslands TEC from 75 ha to 15 ha
- the clearing of the Brockman Iron PEC from 115 ha to 12 ha
- reduced clearing of critical and supporting habitat for northern quoll.

The changes were assessed as being largely the same character as the existing referred proposal and the EPA did not consider the amendment would be a significant amendment if the proposal was already approved.

The EPA Chair's notice of 13 February 2023, consenting to the change is available on the EPA website. The consolidated and updated elements of the proposal which have been subject to the EPA's assessment are included in Table 1.

Proposal alternatives

The proponent undertook a rapid options assessment and analysis to identify the preferred alignment for the proposal (refer sections 2.2.1 and 2.2.2 of Jacobs

2022a). The proponent considered the following matters in identifying the most suitable alignment:

- environmental – presence of known values/sites (threatened flora and fauna species and their habitats, ecological communities)
- heritage – presence of known sites
- earthworks – cut fill volumes, rock potential and route length
- serviceability – risk of flood water inundation and/or backwater effects
- infrastructure impacts – interactions between the option and existing assets
- railway and mining leases – severance.

The proponent has identified a preferred alignment based on consideration of the above matters, being the indicative disturbance footprint. Further refinement to the preferred alignment may occur through finalisation of the project design (Jacobs 2022a). The proponent subsequently undertook a comparison of 3 different alignments which differed slightly, to gauge the extent of disturbance should refinements be required. The 3 alignments are the base case alignment (formerly referred to as the indicative disturbance footprint in the proponents Environmental Review Document), refinement case A (which now forms the indicative disturbance footprint), and refinement case B. The comparison demonstrated that refinements to the indicative disturbance footprint can be made without substantially changing the proposed impact to significant vegetation, threatened fauna habitat or Aboriginal heritage (refer Tables 5-9, 5-10 and 5-28 of Jacobs (2022b).

As demonstrated through the comparative assessment, disturbance to significant vegetation and fauna habitat types will not exceed the disturbance limits described in the proponents document titled '*Manuwarra Red Dog Highway Revised Proposal – Updated Clearing Extents for Revised Indicative Disturbance Footprint, Revision 1'* (Jacobs 2023a). The proponent has therefore referred the proposal in its current alignment to demonstrate that stage 4 can be completed within the maximum impact extents as described in the above document.

Approved proposal implementation

The approved proposal was approved through Ministerial Statement 677, issued on 27 April 2005. Construction of stage 2 of the approved proposal commenced in 2006 and became operational when construction was completed in 2008. Construction of stage 3 was completed in 2020. Stage 4 is the final section of the Manuwarra Red Dog Highway that requires construction.

The EPA has considered that Ministerial Statement 677 required the following management plans, construction management plan, Aboriginal Heritage management plan (AHMP), Threatened Ecological Community (TEC) protection and management plan, vegetation protection and rehabilitation management plan, national park management plan, weed control and management plan and surface drainage management plan.

Annual compliance assessment reports have been submitted as required by Ministerial Statement 677. In May 2016, the former Office of the EPA wrote to the proponent advising stage 2 of the proposal had demonstrated an acceptable level of compliance with Ministerial Statement 677. Regarding stage 3, compliance has been achieved against the construction management plan. Post-construction management measures (largely monitoring and remediation (if necessary)) are still required for the vegetation protection and rehabilitation management plans, weed control and management plan, surface drainage management plan and the national park management plan. The EPA recommends that the ongoing post-construction requirements of these management plans (as referred to under section 2.1.10) form conditions of the new statement, if approved.

The EPA notes that the approved AHMP covers most of the proposed stage 4 development envelope on Yindjibarndi country. The EPA recommends that this AHMP be updated (contemporised) for the portion of the stage 4 development envelope that occurs on Yindjibarndi country (as discussed under section 2.4).

The EPA notes that the TEC Protection and Management Plan was not prepared, as it was specific to stage 4 which has not yet commenced. In favour of reinstating management plan requirements that align with those referred to above, the EPA recommends contemporised outcome-based conditions for impacts that relate to these matters for the revised stage 4, as discussed under each of the relevant key environmental factors.

Proposal context

The proposal comprises the revised proposed stage 4 portion of the Manuwarra Red Dog Highway Project, to construct a 112 km dual-carriageway from Wallyinya Pool to the Nanutarra-Munjina Road, adjacent to the existing Pilbara Rail Company (Rio Tinto) Dampier to Paraburdoo railway (Rio Tinto railway) (Jacobs 2022a). Stages 2 and 3 of the approved proposal, which extend north to just south of Karratha, and have sections that intersect Millstream-Chichester National Park (stage 4 does not), were approved under Ministerial Statement 677 and the construction of these stages has been completed. The proponent notes that the road will provide vital connectivity between Karratha and Tom Price, and access to significant tourism destinations and mine sites in the region (Jacobs 2022a).

The proposal development envelope intersects the Chichester, Fortescue and Hamersley subregions. There are several approved mining proposals within the local area of the Hamersley subregion portion of the alignment, noting the numerous iron ore mining related developments that occur within this subregion. The closest of these proposals include the Eliwana Rail project (approved under Ministerial Statement 1108), Eliwana Iron Ore project (approved under Ministerial Statement 1109) and Solomon Iron Ore project (approved under Ministerial Statement 1062).

The Eliwana Rail project comprises rail infrastructure to service the Eliwana Iron Ore mine (which occurs around 40 km west of the proposal), and runs east-west, intersecting the southern portion of the proposal. The Solomon Iron Ore project footprint occurs within 50 m of the proposal, near the centre portion of the alignment, on the eastern side of the Rio Tinto railway.

The proposal largely follows the alignment of the Rio Tinto railway which has operated since the 1970s and occurs on the western side of the rail infrastructure.

The cumulative impacts of the above projects have been considered within this assessment.

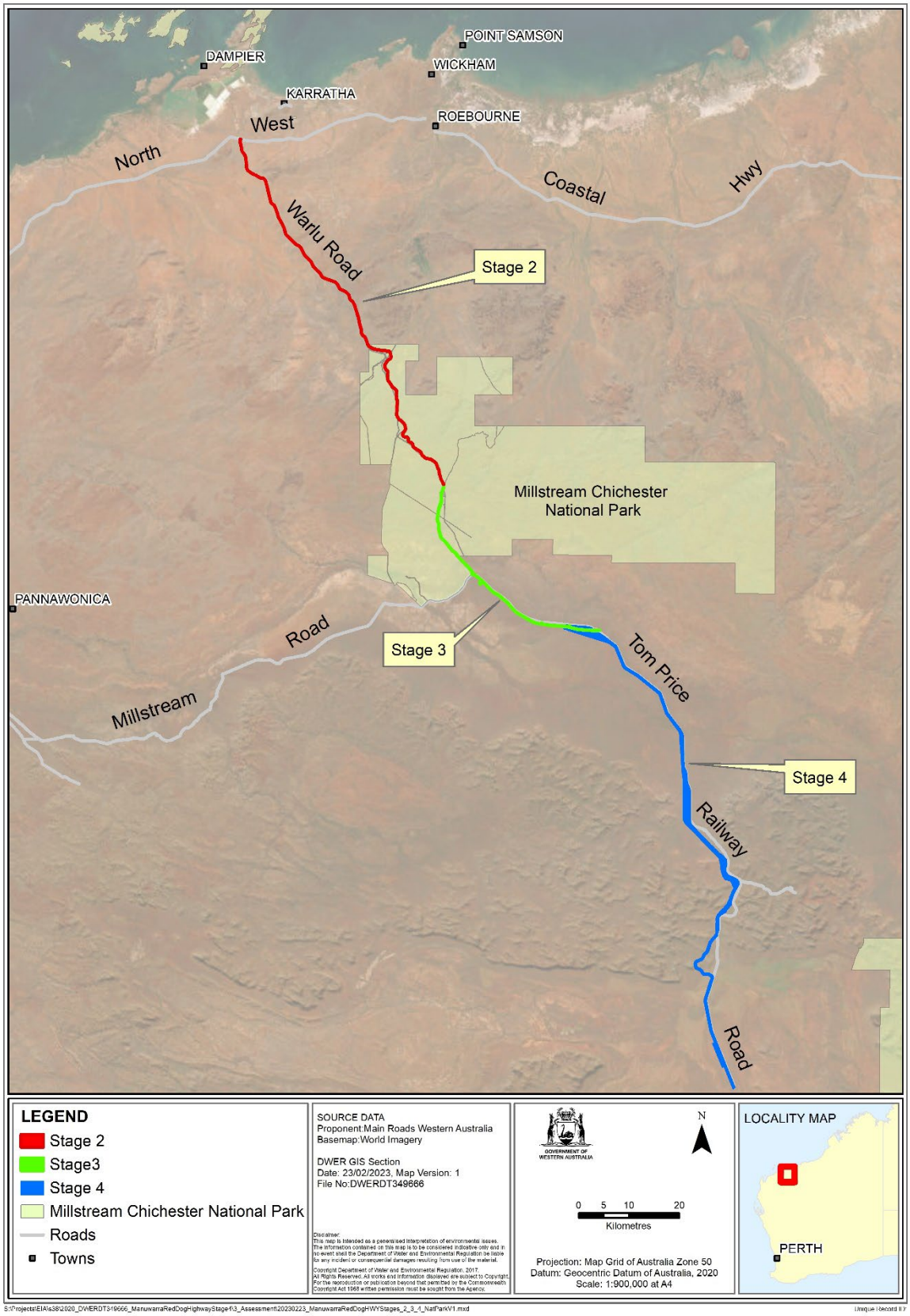

Figure 1: Project location

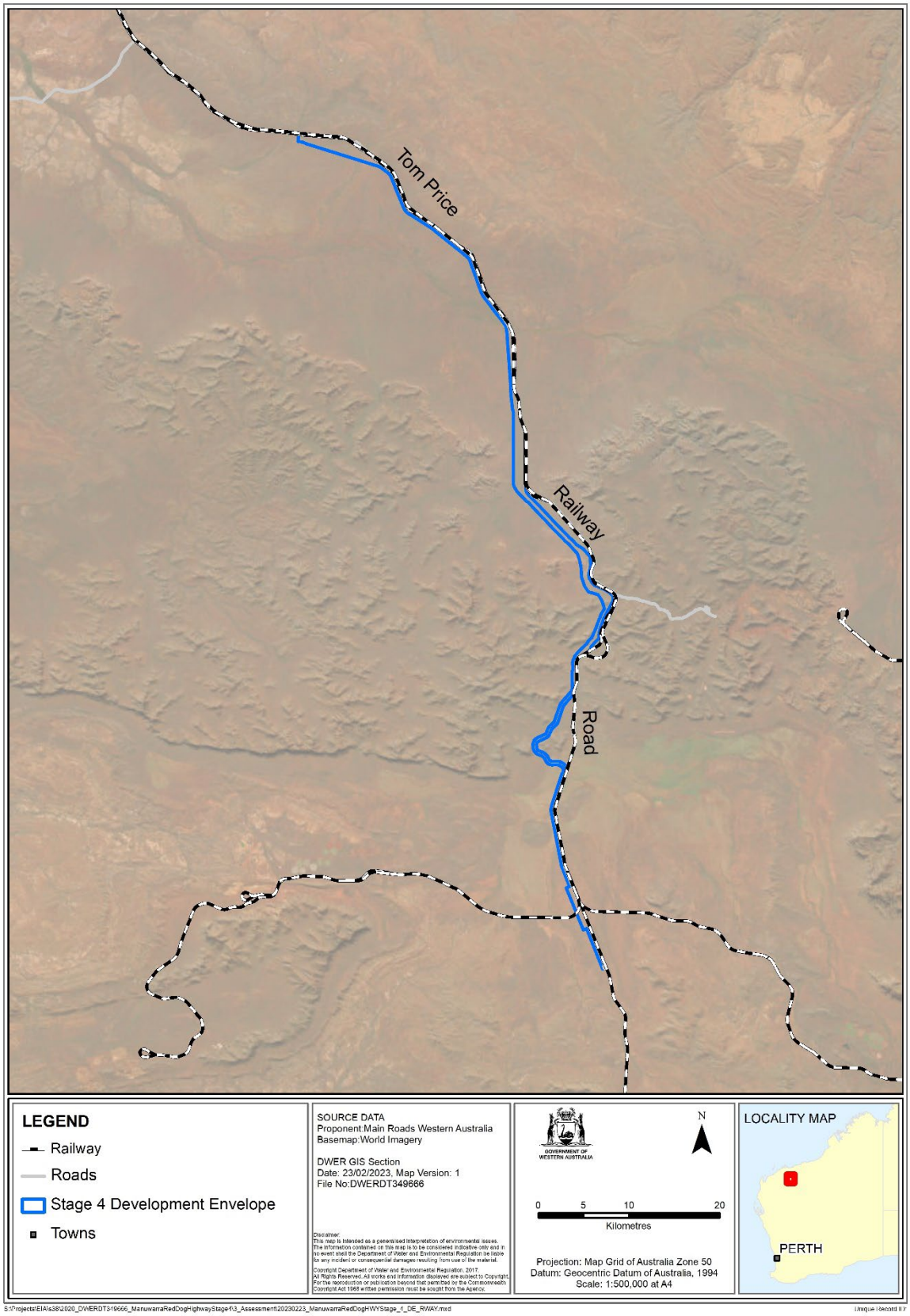

Figure 2: Development envelope

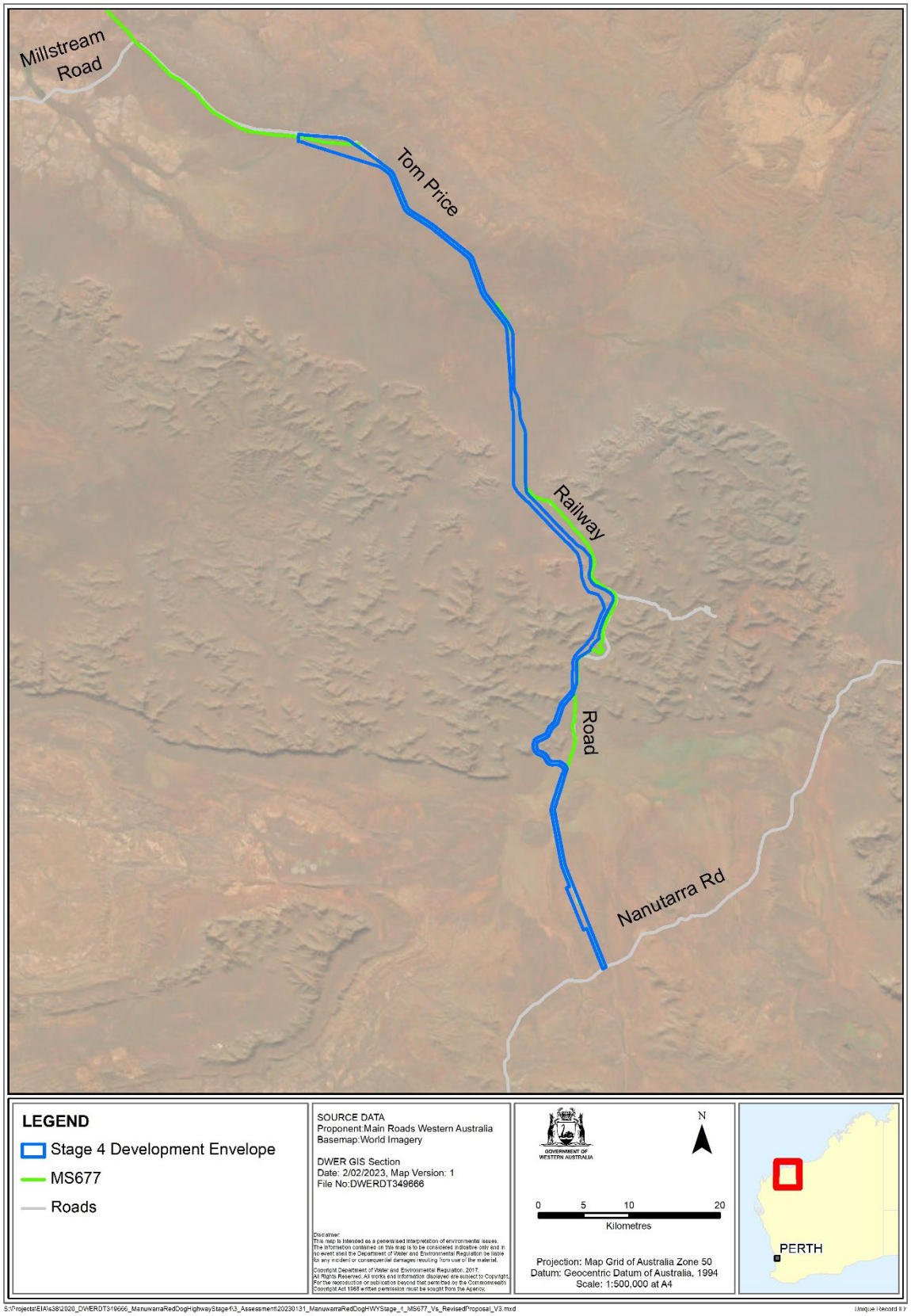

Figure 3. Development envelope of stage 4 (proposed), and original stage 4 alignment approved under Ministerial Statement 677

2 Assessment of key environmental factors

This section includes the EPA's assessment of the key environmental factors. The EPA also evaluated the impacts of the proposal on other environmental factors (air quality, greenhouse gas and human health) and concluded these were not key factors for the assessment. This evaluation is included in Appendix D.

Given the proposal is a significant amendment to an approved proposal, the EPA's assessment has been undertaken in the context of the approved proposal (Ministerial Statement 677), having regard to combined and cumulative effects on the environment. The EPA acknowledges that the assessment of the combined and cumulative impacts has some limitations, noting the considerable time since the approval of the approved proposal in 2005.

The level of detail in the environmental impact assessment of the approved proposal as reported in EPA Report (Bulletin 1159), does not include the level of detail that is expected in contemporary assessments, including defining a development envelope for the proposal, and quantifying impacts to flora, vegetation, and fauna habitat types. However, where possible, the EPA has assessed the combined and cumulative effect that the implementation of the original approval may have on the following environmental factors.

2.1 Flora and vegetation

2.1.1 Environmental objective

The EPA environmental objective for flora and vegetation is *to protect flora and vegetation so that biological diversity and ecological integrity are maintained* (EPA 2021b).

2.1.2 Investigations and surveys

The EPA advises the following surveys were used to inform the assessment of the potential impacts to flora and vegetation:

- Manuwarra Red Dog Highway Stage 4 Biological Survey (appendix 2 of the environmental review document) (Biota 2022b) (the survey)
- Response to Agency and Client Comments: Draft ERD - Manuwarra Red Dog Highway (appendix A of the response to submissions document – validation of vegetation mapping) (Biota 2022c).

The survey covered a survey area of 8,746.4 ha and encompassed the 7,142 ha development envelope.

The 'Response to Agency and Client Comments' survey was undertaken to resample 8 quadrats that had been surveyed outside of the appropriate survey period for the region, and to undertake additional floristic analysis. Collectively, the surveys were consistent with the Technical Guidance – Flora and vegetation surveys for environmental impact assessment (EPA 2016b).

2.1.3 Assessment context – existing environment

Approved proposal (Ministerial Statement 677)

Approximately 505 ha of native vegetation was cleared to complete the construction of stages 2 and 3 of the approved proposal in accordance with Ministerial Statement 677. Flora and vegetation was considered a relevant environmental factor for the approved proposal under the scope of 'Biodiversity'. The assessment of the approved proposal identified significant impacts to the Themeda grasslands TEC (specific to stage 4, not undertaken), and native vegetation contained within Millstream-Chichester National Park (specific to stages 2 and 3). Cumulative impacts of stages 2 and 3 that are relevant to the revised stage 4 proposal are considered under 2.2.9.

The proposal for the revised stage 4 proposes to disturb an additional 657 ha within a development envelope of 7,142 ha (Jacobs 2022a; Main Roads WA 2022b). The impacts to Flora and Vegetation for this proposal are assessed below.

Vegetation

As defined in the Interim Biogeographic Regionalisation of Australia (IBRA), the proposal occurs within the Hamersley, Chichester, and Fortescue subregions of the Pilbara bioregion.

The vegetation within the proposal development envelope ranges in condition from 'Excellent' to 'Completely Degraded'. The survey recorded 29 vegetation types within the development envelope (Biota 2022b).

The indicative disturbance footprint for stage 4 is 657 ha, which includes 645.2 ha of vegetation in 'Good' to 'Excellent' condition, and 11.8 ha of 'completely degraded' and cleared areas (Jacobs 2023a). The proponent has committed to clearing no more than 646 ha of native vegetation in 'Good' to 'Excellent' condition (Jacobs 2023a). Most of the vegetation proposed to be cleared is in 'Very Good' (30.4%) to 'Excellent' condition (53.4%) (Biota 2022b). Of the 29 vegetation types recorded within the development envelope, 28 are proposed to be impacted.

Two conservation significant ecological communities were identified as occurring within the development envelope (Biota 2022b):

- Themeda grasslands on cracking clays threatened ecological community (Themeda grasslands TEC) endorsed as vulnerable by the WA Minister for Environment
- Brockman Iron cracking clays community of Hamersley Range priority ecological community (Brockman Iron PEC) listed Priority 1 by the Department of Biodiversity, Conservation and Attractions (DBCA).

The Brockman Iron PEC is described by DBCA (2022) as "rare tussock grassland dominated by *Astrebla lappacea* in the Hamersley Range, on the Brockman land

system. Tussock grassland on cracking clays – derived in valley floors, depositional floors. This is a rare community, and the landform is rare".

Both identified ecological communities are proposed to be impacted by the proposal (Jacobs 2022a).

Other vegetation communities of local significance proposed to be impacted by the proposal include potential groundwater dependent vegetation (GDV) associated with major drainage lines, grove-intergrove mulga communities, and vegetation communities on cracking clays in the northern section of the development envelope (Biota 2022b).

Flora

A total of 590 native vascular flora species from 190 genera and 56 families were recorded from the survey area (Biota 2022b).

One formerly listed threated flora species, *Seringia exastia*, was recorded within the development envelope (Biota 2022b). Since the survey was undertaken, this species is no longer listed as threatened under the BC Act or considered of conservation significance by DBCA given its now realised commonality and widespread distribution. No other threatened flora species were identified during the survey (Biota, 2022b).

The survey identified 20 priority flora species occurring within the development envelope, that included 2 Priority 1 species, 3 Priority 2 species, 12 Priority 3 species, and 3 Priority 4 species (Table 4, Jacobs 2022a).

Of these species, 3 Priority 3 species, *Euphorbia australis* var. *glabra*, *Glycine falcata* and *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) are proposed to be impacted (Jacobs 2022a). The proponent has committed to avoiding the remaining 16 priority flora species recorded in the development envelope.

Weeds

Fifteen introduced flora species were recorded during the survey (Jacobs 2022a). None of these species are listed as Weeds of National Significance or Declared Pests under the *Biosecurity and Agricultural Management Act 2007*. However, buffel grass (*Cenchrus ciliaris*), birdwood grass (*Cenchrus setiger*), mimosa bush (*Vachellia farnesiana*), kapok (*Aerva javanica*) and ruby dock (*Rumex vesicarius*) are recognised as serious environmental weeds in Western Australia.

2.1.4 Consultation

No public comments were received during the public review period.

The EPA consulted with DBCA regarding the potential impact to Themeda grasslands TEC.

2.1.5 Potential impacts from the proposal

The proposal has the potential to significantly impact on flora and vegetation from:

- clearing of up to 646 ha of native vegetation, of which the majority is in 'Very Good' to 'Excellent' condition
- clearing of vegetation associated with the Themeda grasslands TEC
- clearing of vegetation associated with the Brockman Iron PEC
- clearing of locally significant vegetation
- impact to 3 Priority 3 listed flora species, *Euphorbia australis* var. *glabra*, *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) and *Glycine falcata*
- potential indirect impacts to surrounding vegetation from the introduction and/or spread of weeds, altered hydrological regimes, groundwater drawdown and increased dust deposition.

2.1.6 Avoidance measures

The proponent has designed the proposal to avoid impacts to flora and vegetation by:

- not locating areas of temporary clearing within the mapped extent of the Themeda grasslands TEC, Brockman Iron PEC, or priority flora
- avoiding clearing individuals of 16 (of 19 recorded) priority flora species recorded in the development envelope, including all Priority 1 and Priority 2 species.

2.1.7 Minimisation measures (including regulation by other DMAs)

The proponent has proposed the following measures to minimise impacts to flora and vegetation (Jacobs 2022a; Jacobs 2022c):

- setting limits on the extent of clearing and disturbance for significant vegetation types to no more than:
    - 15 ha of the Themeda grasslands TEC (reduced from 17.5 ha as approved under Ministerial Statement 677)
    - 12 ha of the Brockman Iron PEC
    - 20.1 ha of potential GDV
    - 80.9 ha of grove-intergrove mulga communities
    - 13.4 ha (13.2 ha and 0.2 ha of vegetation types C2 and P7 respectively) of grasslands occurring on cracking clays in the northern section of the development envelope
    - 646 ha of vegetation in a 'Good' to 'Excellent' condition
- vehicles and equipment access limited to designated roads/access tracks and cleared areas

- vehicles and equipment to be inspected and cleaned of soil, vegetative material, and seeds on entry/exit to site
- treat weeds within the construction site boundary in accordance with Weeds Australia management measures
- dust suppression measures including the use of water sprays, stopping works when deemed too dusty, and setting vehicle speed limits, will be implemented during construction activities as required
- progressively revegetating all temporary cleared areas post construction, comprising 100 ha, to re-establish pre-existing native vegetation
- limit indirect impacts to vegetation from altered hydrological regimes through incorporating adequate surface water management structures into the final road design.

2.1.8 Revegetation measures

The proponent proposes to progressively revegetate all temporarily cleared areas (100 ha), including borrow pits, laydowns, stockpiling areas, and areas cleared for ancillary infrastructure (Jacobs 2022a). To date, 137 ha has been rehabilitated for temporary clearing required for the construction of stages 2 and 3. The proponent proposes to revegetate temporary cleared areas in accordance with the Main Roads Revegetation Planning and Techniques Guideline (D12#157550 Rev 0).

2.1.9 Assessment of impacts to environmental values

The EPA considered the potential impacts to vegetation in 'Good' to 'Excellent' condition including vegetation associated with conservation significant ecological communities and locally significant vegetation communities are likely to be significant residual impacts of the proposal and are assessed further in this section.

The EPA also considered the proposal has the potential to impact priority flora species and this impact is assessed further in this section.

The EPA has assessed the proposal in the context of the approved proposal while having regard to the combined and cumulative effect that the implementation of the approved proposal may have on flora and vegetation.

Vegetation

Vegetation in 'Good' to 'Excellent' condition and locally significant vegetation

The EPA has assessed the likely residual impacts of the proposal on vegetation to be clearing of up to 646 ha of vegetation in a 'Good' to 'Excellent' condition in the Pilbara bioregion. The EPA recognises that cumulative loss of native vegetation through current and future mining, pastoralism, and infrastructure developments is a key threat to flora and vegetation values within the Pilbara bioregion. The proposal

includes the clearing of native vegetation within the Fortescue, Hamersley, and Chichester subregions (Jacobs 2023b).

The development envelope includes 3 vegetation communities that are locally significant:

- potential GDV
- grove-intergrove mulga communities
- vegetation on cracking clays (excluding the cracking clay communities considered representative of the Themeda grasslands TEC and Brockman Iron PEC) (Biota 2022b).

The vegetation on cracking clays community was recorded in the northern extent of the development envelope, comprising vegetation types C2 and a portion of P7. This community comprises species similar to 1 of the 4 assemblages of the Wona Land System PEC, being the “Mitchell grass and Roebourne Plain grass (*Eragrostis xerophila*) plain on gilgai” (Priority 3) (Jacobs 2022a). Vegetation types C2 and P7 do not meet all diagnostic criteria of the PEC, as they occur within the Hooley Land System located around 15 km from the Wona Land System (Biota 2022b). However, these vegetation types are of local conservation significance noting their similarity and proximity to the PEC.

Of the 250 ha of the vegetation on cracking clays community recorded in the development envelope, the proponent has committed to a maximum clearing extent of 13.2 ha of vegetation type C2 and 0.2 ha of vegetation type P7 (Jacobs 2023b). As a result, approximately 94.7% of the vegetation on cracking clays community would remain within the development envelope post clearing (refer Table 2).

The grove-intergrove mulga communities were described as growing in a distinctive banded pattern and are represented by vegetation types M1 and M2 (Biota 2022b). These distinctive communities have a restricted occurrence and share similarities with, but are not considered representative of, other grove-intergrove mulga communities listed as PECs, such as the Frederick Land System Priority 3 PEC. These communities are highly dependent on sheet flow.

Of the 662.4 ha of the grove-intergrove mulga communities recorded in the development envelope, the proponent has committed to a maximum clearing extent of 80.9 ha across the 2 vegetation types that make up these communities (Jacobs 2023b). As a result, approximately 87.8% of these communities would remain within the development envelope post clearing (refer Table 2).

Potential GDV was identified within the development envelope via the presence of *Melaleuca glomerata*, which is a highly groundwater dependent species, and *Eucalyptus camaldulensis*, *Eucalyptus victrix* and *Melaleuca argentea*, which are known to have a low to moderate dependency on groundwater (Biota 2022b).

The vegetation types identified as potential GDV were restricted to major drainage lines including Fortescue River, Weelamurra Creek and Barnett Creek and are represented by vegetation types D1, D2 and D3 (Biota 2022b). The proponent has committed to a maximum clearing extent of 20.1 ha of potential GDV of the 540.2 ha

recorded in the development envelope. Approximately 96% of potential GDV communities would remain within the development envelope post clearing (refer Table 2).

The above locally significant vegetation communities rely heavily on overland surface water flows and are sensitive to any changes to existing hydrological regimes. The potential indirect impact from changes to surface water flows is assessed further below (see the 'Indirect impact to flora and vegetation' section).

The EPA has assessed the residual impact to native vegetation in 'Good' to 'Excellent' condition (which includes locally significant vegetation communities), to be significant. The EPA considers that the significant residual impact can likely be regulated through recommended conditions A1-1 and B2-1(3), requiring clearing extent limits, and counterbalanced by offsets (recommended condition B6) (refer section 4). This will ensure the environmental outcome is likely to be consistent with the EPA objective for flora and vegetation.

Table 2. Limits of disturbance to locally significant vegetation

Vegetation type	Extent recorded in development envelope (ha)	Limit of disturbance (ha)	Extent remaining within development envelope post-clearing (ha)
Vegetation on cracking clays			
C2	206.8	13.2	193.6 (93.6%)
P7	43.2	0.2	43 (99.5%)
Total	250.0	13.4	236.6 (94.7%)
Grove-intergrove mulga communities			
M1	169.9	17.7	152.2 (89.6%)
M2	492.5	63.2	429.3 (87.2%)
Total	662.4	80.9	581.5 (87.8%)
Potentially groundwater dependant vegetation			
D1	500.4	16.8	483.6 (96.6%)
D2	21.3	0.1	21.2 (99.5%)
D3	18.5	3.2	15.3 (82.7%)
Total	540.2	20.1	520.1 (96.3%)

Conservation significant ecological communities

The Themeda grasslands TEC and Brockman Iron PEC occur immediately adjacent to one another within the southern extent of the proposed stage 4 development envelope (Figures 4 and 5). Both ecological communities are bisected by the existing Rio Tinto rail line which has operated in this area since the 1970s. In areas where the development envelope intersects the communities, the development envelope has been aligned to run as close as possible, and parallel to, the Rio Tinto rail line on

the western side, to minimise the risk of further fragmenting the remaining extent of both.

The survey identified that vegetation types C4, C5 and P6 are representative of the Themeda grasslands TEC. These are described as:

- C4 –*Themeda sp*. Hamersley Station (M.E.Trudgen 11431) tussock grassland.
- C5 –*Eucalyptus victrix* scattered low trees over *Eriachne benthamii*, *Themeda sp.*. Hamersley Station (M.E. Trudgen 11431)) very open tussock grassland over mixed open herbland.
- P6 –*Hakea lorea* subsp. *Lorea* low open woodland over **Vachellia farnesiana* scattered shrubs over *Themeda sp.* Hamersley Station (M.E. Trudgen 11431) tussock grassland.

These vegetation types are in a 'Good' to 'Very Good' condition (Biota 2022b). The proponent has committed to a maximum clearing extent of 15 ha for the Themeda grasslands TEC, of the 115.2 ha recorded in the development envelope. Approximately 87% of this community would remain within the development envelope post clearing (refer Table 3).

The survey identified that vegetation type C3, which is described as mixed *Astrebla* tussock grassland over *Urochloa occidentalis* var. *occidentalis* bunch grassland, is representative of the Brockman Iron PEC (Biota 2022b). Vegetation type C3 is in a 'Very Good' condition (Biota 2022b). The proponent has committed to a maximum clearing extent of 12 ha for the Brockman Iron PEC, of the 88.1 ha recorded in the development envelope. As a result, approximately 86% of this community would remain within the development envelope post clearing (refer Table 3).

Based on available databases from DBCA, approximately 4,740 ha of the Themeda grasslands TEC and 12,540 ha of the Brockman Iron PEC remain. The EPA notes that this mapping is indicative and requires ground-truthing to validate. However, it provides indicative data to estimate impacts of these communities on a regional scale. Based on these figures, the proposal has the potential to impact up to 0.3% of the total mapped Themeda grasslands TEC and less than 0.1% of the total mapped Brockman Iron PEC.

The EPA considers that the loss of 15 ha of the Themeda grasslands TEC and 12 ha of the Brockman Iron PEC is significant. The EPA advises that the significant residual impact can likely be regulated through recommended conditions B2-1(2), and B2-1(3), which require no temporary clearing of the TEC or PEC and set maximum clearing limits. The EPA considers that the significant residual impact can likely be counterbalanced by offsets (recommended condition B6) (refer section 4). These conditions would ensure that the environmental outcome is likely to be consistent with the EPA objective for flora and vegetation.

The EPA notes that modifications to the Themeda grasslands TEC will require authorisation under section 45 of the BC Act.

Both the Themeda grasslands TEC and Brockman Iron PEC rely heavily on overland surface water flows and are sensitive to changes in existing hydrological regimes.

The potential indirect impact from changes to surface water flows is assessed further below (see the 'Indirect impact to flora and vegetation' section).

Table 3. Limits of disturbance to threatened and priority ecological communities

Vegetation type	Extent recorded in development envelope (ha)	Limit of disturbance (ha)	Extent remaining within development envelope post-clearing (ha)
Vegetation representative of the Themeda grasslands TEC			
C4	72.7	11.1	61.6 (84.7%)
C5	4.3	0.7	3.6 (83.7%)
P6	38.2	3.2	35 (91.6%)
Total	115.2	15	100.2 (87.0%)
Vegetation representative of the Brockman Iron PEC			
C3	88.1	12	76.1 (86.4%)

Priority flora

The survey identified 19 priority flora species within the development envelope (Jacobs, 2022a). Of these species, 3 priority 3 species, *Euphorbia australis* var. *glabra*, *Glycine falcata* and *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) are proposed to be impacted by stage 4 of the proposal (Jacobs 2022a).

The proponent has committed to avoiding the remaining 16 priority flora species recorded in the development envelope (Jacobs 2022a). These include Priority 1 and Priority 2 species, *Hibiscus* sp. Mt Brockman (E. Thoma ET 1354) (Priority 1), *Josephinia* sp. Woodstock (A.A. Mitchell PRP 989) (Priority 1), *Aristida Lazaridis* (Priority 2), *Euphorbia inappendiculata* var. *inappendiculate* (Priority 2), and *Euphorbia inappendiculata* var. *queenslandica* (P2). The proponent has also committed to avoiding a former Priority 1 listed species, *Vittadinia* sp. Coondewanna Flats (S. van Leeuwen 4684) which is now listed as a Priority 3 species (now known from a higher number (26) of records over a 290 km range).

The extent of proposed impact to the 3 priority flora species is (Jacobs 2022a):

- *Euphorbia australis* var. *glabra* – 24 out of around 755 individuals recorded in the development envelope are proposed for impact (represents 3.2% of individuals recorded)
- *Glycine falcata* – 1 out of 21 individuals plus 0.5% vegetation cover in one quadrat (exact number of individuals not quantified) recorded in the development envelope is proposed for impact (represents less than 4.5% of individuals recorded, as the exact ratio of impacted individuals cannot be quantified)
- *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) – around 1.5% to 28% vegetation cover in 8 quadrats out of 8,500+ individuals and 8 quadrats ranging

from 0.5–50% vegetation cover (exact number of individuals not quantified) (estimated that 14% of total individuals in the development envelope would be impacted) (Jacobs 2022a).

The EPA considers that the proposed clearing is not likely to impact on the conservation status or local or regional extent of the above species, and is therefore not a residual impact that requires a condition to ensure the EPA's objective can be met noting:

- the proposed extent of impact to each species relative to the extent recorded in the broader development envelope
- these species are known from 14 or more known records (60 in the case of *Themeda* sp. Hamersley Station (M.E. Trudgen 11431)
- these species have an extensive range
- the records within the development envelope do not represent a range extension for these species.

Indirect impact to flora and vegetation

The potential indirect impacts must be actively managed to ensure the biological diversity and ecological integrity of the vegetation in the local area is not adversely impacted by the proposal. The EPA has assessed potential residual impacts to flora and vegetation from indirect impacts to be:

- introduction and spread of weeds to adjacent vegetation
- changes to hydrological regimes
- fragmentation of the Themeda grasslands TEC and Brockman Iron PEC
- increased dust deposition from construction activities.

Introduction and spread of weeds to adjacent vegetation

There is potential for project activities to introduce and increase the spread of weeds throughout the development envelope and adjacent vegetation. Minimising the risk of weed spread into the Themeda grasslands TEC is of particular importance given that weed invasion is recognised as one of the key threatening processes to this community.

To prevent the introduction and spread of weeds during construction, the proponent will ensure appropriate vehicle and machinery hygiene, management and quarantining of weed contaminated topsoil stockpiles, appropriate removal of any cleared material containing weeds, and will undertake weed monitoring, and control as necessary, both monthly during construction, and annually post-construction (Jacobs 2022a).

Post-construction, the proponent commits to ensuring that there is no introduction or spread of Weeds of National Significance, Declared Pests, or serious environmental weed species from the project. The EPA recommends conditions B2-1(4) and B2-2

to demonstrate that there are no adverse impacts to the Themeda grasslands TEC, Brockman Iron PEC, GDV, or locally significant vegetation communities compared to that recorded in the baseline biological survey (Biota 2022b). These conditions would ensure that the environmental outcome is likely to be consistent with the EPA objective for flora and vegetation.

Changes to existing hydrological regimes and sedimentation

The proposal has the potential to indirectly impact flora and vegetation from changes to existing hydrological regimes through groundwater abstraction and dewatering, changes in surface water flows and potential increase in sedimentation from disturbance to the bed and banks of watercourses.

The potential GDV recorded within the development envelope is highly sensitive to changes in groundwater levels. The EPA has considered that groundwater abstraction (for construction water) and dewatering (for bridge construction over Weelamurra Creek) will only be required during construction (30-month period) and any drawdown will be temporary and of short duration.

The proponent has undertaken a hydrogeological risk assessment for groundwater drawdown, which considered a worst-case scenario (no recharge, all water requirements from 1 bore) and identified that even at close distances, groundwater abstraction impacts are predicted to be low (Jacobs 2022a). The proponent notes that abstraction would occur over several well locations along the alignment, which would further reduce the likelihood of impact to potential GDV (Jacobs 2022a). The proponent has committed to developing a Groundwater and Surface Water Operating Strategy to ensure no impact to potential GDV due to groundwater drawdown. The proponent further notes that it plans to obtain construction water from existing licensed Rio Tinto bores (within their allocated and approved licensed extraction rates) for the northern 78% of the 112 km proposed stage 4 alignment (Jacobs 2022a).

For the remaining groundwater requirements, the proponent will require licenses under the RIWI Act which will consider the impacts of abstraction. The EPA recommends condition B2-1(4)(c), and B2-2 to ensure that there are no adverse impacts to GDV from changes in groundwater levels (including preparation of a monitoring plan).

Changes to surface water flows and increased sedimentation due to the construction and presence of the road must be managed appropriately to avoid indirectly impacting vegetation that is reliant on surface water flows, including the Themeda grasslands TEC (DBCA 2020), Brockman Iron PEC, drainage vegetation types and the grove-intergrove mulga communities. Inappropriate management of surface water can lead to shadowing, flooding, waterlogging, and sedimentation that can impact the structure and composition of vegetation.

The EPA notes that the design phase of the road has not progressed sufficiently to determine specific details of waterway crossings and/or surface water management structures. The EPA considers that based on the advice of the Department of Water and Environmental Regulation (DWER), further modelling of specific waterway

crossing designs is required (once detailed design is available) to ensure the environmental outcome of maintaining existing surface water flows and quality will be met, particularly noting the sensitivity of the Themeda grasslands TEC and Brockman Iron PEC to changes in surface water flows. The proponent notes that road and drainage design will maintain the existing hydrological regime of the area through ensuring the road alignment matches the direction of natural flow, using best practice culvert, bridge and floodway designs, and minimising the dam effect of the road formation to prevent shadowing (Jacobs 2022a).

The proponent has committed to developing a Groundwater and Surface Water Operating Strategy to ensure maintenance of existing hydrological regimes. The EPA recommends conditions B2-1(4), and B2-2 to ensure that there are no adverse impacts to significant ecological communities from changes in surface water flows and quality and require preparation of a monitoring plan to demonstrate how achievement of no adverse impacts to significant ecological communities will be monitored and substantiated.

Fragmentation of the Themeda grasslands TEC and Brockman Iron PEC

The development envelope bisects a mapped occurrence of the Themeda grasslands TEC and Brockman Iron PEC, and the proposal will increase the risk of fragmentation and isolation of the smaller portions of these communities that exist on the western side of the development envelope (see Figure 4). At the location of the intersection with the TEC and PEC, the proponent has aligned the road as closely as possible to the existing Rio Tinto rail and associated rail access road, noting that this infrastructure also bisects the TEC and PEC.

Based on the indicative disturbance footprint, the road will occur within 90 m of the existing rail infrastructure. This will help to minimise the risk of isolating larger patches of the TEC/PEC that occur between the rail and proposed road. The rail, which has an infrastructure width of around 100 m at the point of intersection with the TEC and PEC, has been operating since the 1970s. The TEC and PEC have continued to exist on the west side of the railway since rail construction and operation, and the EPA considers that construction of stage 4 of the highway in this location, of lesser width than the rail infrastructure, is unlikely to result in significant additional fragmentation of the TEC or PEC. This is also noting the recommended conditional requirements relating to maintaining existing hydrological regimes, as noted above under ‘Changes to existing hydrological regimes’. The EPA recommends condition B2-1(4)(a) and B2-1(4)(b) to ensure that there are no adverse impacts to the Themeda grasslands TEC and Brockman Iron PEC.

Increased dust deposition from construction activities

The potential impact of dust deposition to adjacent flora and vegetation is likely to be temporary and only during construction activities. To minimise impact of dust, all temporary cleared areas will be revegetated to reduce areas of bare ground. Furthermore, the proponent has committed to engaging dust suppression strategies during construction, including suspending works at the direction of the environmental representative if it is deemed too dusty, utilising water sprays, limiting the number and height of stockpiles, and setting speed limits for vehicles during construction

activities. Construction is expected to be completed within 30 months at which time the road will be fully sealed (Jacobs 2022a).

The EPA assessed the proponent's proposed mitigation measures for dust emissions and determined that they would be sufficient to ensure the EPA objective for flora and vegetation is met.

Cumulative impact assessment

The proponent has assessed the cumulative effects of the proposal by considering the proposed impacts of stage 4 with the completed stages 2 and 3, and additional projects within the local area. The EPA's cumulative impact assessment has considered: cumulative effects due to the range of impacts and pressures in the area affected by the proposal; and whether the environment affected by the proposal has significant value due to other successive, incremental, and interactive cumulative impacts in the assessment area. It is considered that the cumulative impacts to the Themeda Grasslands TEC, Brockman Iron PEC, vegetation in a 'Good' to 'Excellent' condition and priority flora are not at a level that would warrant a decision to allow no further clearing of these values for this proposal. However, mining and infrastructure development impact pressures in the region and local area are such that the EPA must consider and appropriately manage the incremental loss of these values. The detailed assessment of cumulative impacts to these values is presented below.

Stages 2 and 3 of the Manuwarra Red Dog Highway Project

To date, around 505 ha of native vegetation has been cleared under Ministerial Statement 677 to construct stages 2 and 3 of the proposal. This includes 137 ha of temporarily cleared areas that have been rehabilitated, as per Ministerial Statement 677 which required the development of a vegetation protection and rehabilitation management plan. The condition of the 505 ha of vegetation cleared under stages 2 and 3 was not quantified. Assuming a worst-case scenario where all vegetation in stages 2 and 3 was in 'Good' to 'Excellent' condition (precautionary principle), the combined effect of these stages with the current proposal is the loss of 1,151 ha of vegetation in a 'Good' to 'Excellent' condition. On a bioregional scale, the proposal is likely to contribute to the loss of around 0.06% of vegetation clearing within the Pilbara Bioregion (Government of Western Australia 2019).

The Themeda grasslands TEC and the Brockman Iron PEC were not impacted under stages 2 or 3. No priority flora species recorded within the stage 4 development envelope were impacted under stages 2 or 3.

Related projects within the local area

The EPA has had regard to the cumulative effects of the proposal by considering this proposal in addition to the following related approved and implemented projects (based on their relatively close proximity), including the Eliwana Rail, Eliwana Iron Ore Mine and Solomon Iron Ore Mine projects. The impact of each project on flora and vegetation values consistent with the proposal are shown in the below table:

Table 4. Cumulative flora and vegetation impacts of projects in the local area

Environmental value being impacted	Eliwana Rail Project impact	Eliwana Iron Ore Mine Project impact	Solomon Iron Ore Mine Project impact	Cumulative impact
Themeda Grasslands TEC	40 ha	0	0	40 ha
Brockman Iron PEC	1.37 ha	0	11 ha	12.37 ha
Priority flora	Overlapping impact with *Euphorbia australis* var. *glabra*, *Glycine falcata* and *Themeda* sp. Hamersley Gorge. Impact to no more than 6% of known individuals.	No impact to priority flora being impacted by the current proposal.	No impact to priority flora being impacted by the current proposal.	*Euphorbia australis* var. *glabra*, *Glycine falcata* and *Themeda* sp. Hamersley Gorge (extent of impact not quantified).
Native vegetation in 'Good' to 'Excellent' condition	3,690 ha	7,879 ha	12,416 ha	23,985 ha

On a bioregional scale, the proposal, when combined with the above projects, is likely to contribute to the loss of 25,136 ha of vegetation in a 'Good' to 'Excellent' condition from the Pilbara Bioregion. The Pilbara Bioregion contains an estimated 17,731,764 ha of native vegetation (Government of Western Australia 2019). The cumulative impact represents the loss of around 0.14% of vegetation in 'Good' to 'Excellent' condition from the Pilbara. Cumulatively, the native vegetation to be impacted is limited to a relatively small extent in comparison to the native vegetation remaining in the Pilbara Bioregion.

The cumulative impact to the Themeda grasslands TEC and Brockman Iron PEC is 55 ha and 24.37 ha respectively, considering the above projects and current proposal. Based on indicative mapping from DBCA, approximately 4,740 ha and 12,540 ha of the Themeda grasslands TEC and Brockman Iron PEC remains. The EPA notes that this mapping is indicative and requires ground-truthing to validate. However, it provides indicative data to estimate impacts of these communities on a regional scale. The 55 ha and 24.37 ha impacts, represent a loss of up to 1.16% and 0.19% of the total mapped extent of the TEC and PEC respectively.

The TEC is primarily mapped as a singular large occurrence, comprising largely contiguous patches which extend around 24 km east-west within the Hamersley subregion (see Figure 4). Therefore, its regional and local known extent is the same. The Rio Tinto rail line dissects the TEC. The proposal is within 100 m of, and runs parallel to the Rio rail, and impacts a small portion of 2 large patches (comprising

397 ha) west of the Rio rail. The Eliwana Rail project impacts a small portion of a larger 971 ha patch of the TEC east of the Rio rail.

The Brockman Iron PEC occurrence mirrors that of the Themeda grasslands TEC, extending slightly further east-west and south through contiguous patches. It too is dissected by the Rio rail. The proposal impacts a small portion of a large patch to the west of the Rio rail. The Solomon Iron Ore Mine and Eliwana Rail projects both impact small portions of larger patches of the PEC on the opposite (east) side of the Rio Tinto railway.

The EPA considers that cumulatively, the TEC and PEC impacts are small relative to the extent of their mapped local occurrence. The EPA considers that the cumulative impacts with the specified nearby projects do not have the effect of creating smaller, discrete and unviable patches of the TEC or PEC. This is noting that the projects impact on much larger patches of the TEC/PEC and occur on opposite sides of the Rio rail line.

The Eliwana Rail project impacts 3 Priority 3 flora species that will also be impacted by the proposal. The Eliwana Rail project impact extent to these species was referred to as less than 6% of total known individuals. The proposal would impact a small proportion of total individuals mapped within the development envelope (estimated at between 3.2 and 14%). These species are all known from 14 or more known records and have an extensive range, therefore cumulative impacts will not have the effect of significantly impacting on the local or regional extent of these species.

Cumulatively, and when assessed in the context of other projects, the proposal will result in a relatively small incremental loss of native vegetation in a ‘Good’ to ‘Excellent’ condition, priority flora, Themeda grasslands TEC and Brockman Iron PEC in the bioregion and local area (noting known extents). Should this proposal be approved with EPA’s recommendation for offsets (section 4), it would combine with offset contributions from other projects in the bioregion, to deliver offset projects through the Pilbara Environmental Offsets Fund to provide environmental benefits within the Pilbara.

2.1.10 Summary of key factor assessment and recommended regulation

The EPA has considered the likely residual impacts of the proposal on flora and vegetation environmental values. In doing so, the EPA has considered whether reasonable conditions could be imposed, or other decision-making processes can ensure consistency with the EPA factor objective. The EPA assessment findings are presented in Table 5.

The EPA has considered that under the approved proposal, Ministerial Statement 677 required the preparation and implementation of vegetation protection and rehabilitation management plans, a weed control and management plan, a surface drainage management plan and a national park management plan. The EPA has approved these plans. For stage 2, the proponent has achieved compliance against

all required management plans. For stage 3, the proponent is required to undertake ongoing monitoring and remediation (if necessary) in accordance with these plans. The EPA has also considered the requirement of Condition 6-1(5) of Ministerial Statement 677 which required the proponent to undertake weed control and management along the road both during and after construction. The EPA recommends conditions B2-4 and B7 to ensure the ongoing management of weeds (kapok and ruby dock) within 50 m of the proposal in the Millstream-Chichester National Park (relevant to stages 2 and 3 only) and ongoing post-construction requirements of the management plans are met.

The EPA has also considered the principles of the EP Act (see Appendix C) in assessing whether the residual impacts will be consistent with its environmental factor objective and whether reasonable conditions can be imposed (see Appendix A).

Table 5: Summary of assessment for flora and vegetation

Residual impact or risk to environmental value	Assessment finding or Environmental outcome	Recommended conditions and DMA regulation
<u>Proposal (significant amendment)</u> Clearing of 646 ha of native vegetation in 'Good to Excellent' condition within the Fortescue, Hamersley and Chichester subregions which includes locally significant vegetation communities comprising potential GDV, vegetation communities on cracking clays and grove-intergrove Mulga communities. <u>Combined effect (with stages 2 and 3)</u> Stages 2 and 3 involved the clearing of around 505 ha, including 137 ha of temporary clearing. The extent of this vegetation in a 'Good' to 'Excellent' condition was not quantified. Assuming that all vegetation was in 'Good' to 'Excellent' condition, the combined effect of stages 2 and 3 with the current proposal is the loss of 1,151 ha of vegetation in 'Good' to 'Excellent' condition. There was 28.47 ha of potential GDV impacted under Stages 2 and 3. The combined effect on potential GDV is 48.57 ha.	The clearing of 'Good' to 'Excellent' condition vegetation within and immediately adjacent to the Pilbara bioregion, which includes locally significant vegetation communities, is significant in the context of biological diversity and ecological integrity, as it provides habitat for conservation significant flora and fauna species. The EPA advises that impacts to locally significant vegetation communities are not likely to be significant, noting that at least 82.7% of each vegetation type that is representative of locally significant vegetation communities will remain in the development envelope. The EPA advises that subject to limitations on clearing extent, and recommended conditions requiring offsets, the significant residual impact can be managed and counterbalanced, so that	**Conditions A1 (Limitations and extent of proposal) and B2 (Flora and vegetation)** Disturbance limits to clearing of vegetation in a 'Good' to 'Excellent' condition and locally significant vegetation communities. **Condition B6 (Offsets)** Contribution to the Pilbara Environmental Offsets Fund for the clearing of 'Good' to 'Excellent' condition vegetation (which includes locally significant vegetation communities) within the Pilbara bioregion.

Residual impact or risk to environmental value	Assessment finding or Environmental outcome	Recommended conditions and DMA regulation
The extent of impact to vegetation communities on cracking clays and grove-intergrove Mulga communities was not quantified for stages 2 and 3.	the environmental outcome is likely to be consistent with the EPA objective for flora and vegetation.	
<u>Proposal</u> Clearing of the following conservation significant ecological communities: • 15 ha of the Themeda grasslands TEC • 12 ha of the Brockman Iron PEC <u>Combined effect</u> No clearing of the Themeda grasslands TEC or Brockman Iron PEC was required for stages 2 or 3 of the project. Stage 4 of the approved proposal, none of which has been constructed to date, included the clearing of 17.5 ha of Themeda grasslands TEC, this has been reduced to 15 ha for the revised stage 4. There was no reference to Brockman Iron PEC impacts from stage 4 under Ministerial statement 677. However, the stage 4 alignment of the approved proposal intersected the mapped occurrence of the PEC and would likely have impacted this community should it have progressed.	The EPA advises that the proposed clearing of 15 ha of the Themeda grasslands TEC and 12 ha of the Brockman Iron PEC is a significant residual impact. The EPA advises that this significant residual impact can likely be regulated through reasonable conditions that require clearing extent limitations and counterbalanced by offsets so that the environmental outcome is likely to be consistent with the EPA objective for flora and vegetation.	**Condition B2 (Flora and vegetation)** Disturbance limits to conservation significant ecological communities. **Condition B6 (Offsets)** Contribution to the Pilbara Environmental Offsets Fund for the clearing of conservation significant ecological communities.
<u>Proposal</u> Indirect impact to flora and vegetation from weeds, changes to hydrological regimes, dust emissions and fragmentation. <u>Combined effect</u> Not expected to be significant given the long linear infrastructure	The EPA advises there is unlikely to be significant residual impacts from the introduction and spread of weeds or altered hydrological regimes subject to recommended conditions requiring no adverse impacts and continued implementation of	**Condition B2 (Flora and vegetation)** Environmental outcomes ensuring there are no project attributable adverse impacts to significant ecological communities, and

Residual impact or risk to environmental value	Assessment finding or Environmental outcome	Recommended conditions and DMA regulation
and hydrological nature of the area.	management plans associated with stage 3 (monitoring and remediation if necessary). Subject to these conditions, the environmental outcome of no adverse impacts is likely to be consistent with the EPA objective for flora and vegetation.	continued implementation of weed control and management around the road in Millstream-Chichester National Park. **Condition B7 (Original proposal environmental management plans)** Implement the post-construction requirements of the vegetation protection and rehabilitation management plans, weed control and management program, surface drainage management plan and national park management plan for stage 3.

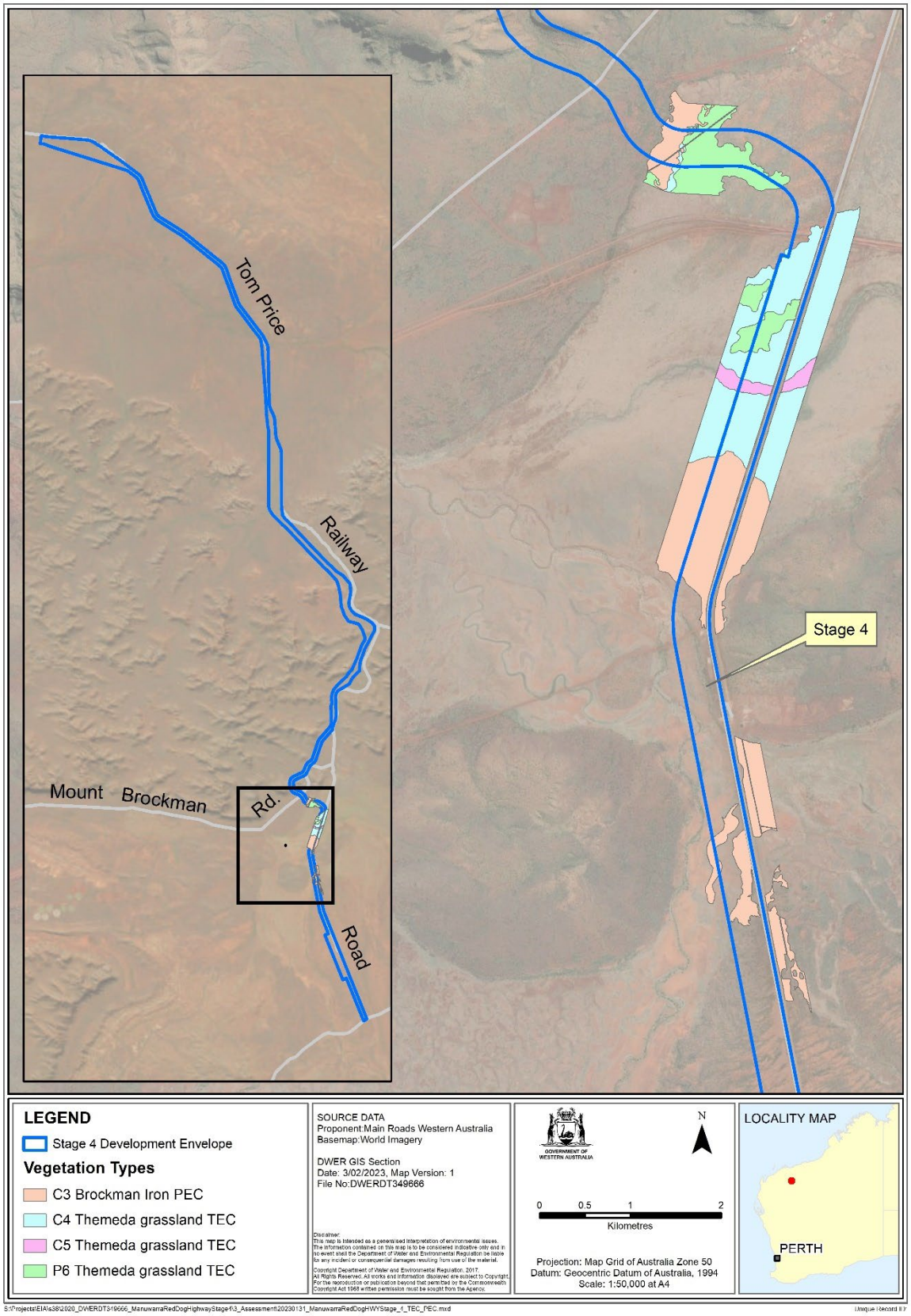

Figure 4. Extent of the Themeda grasslands TEC recorded within the development envelope by Biota (2022b).

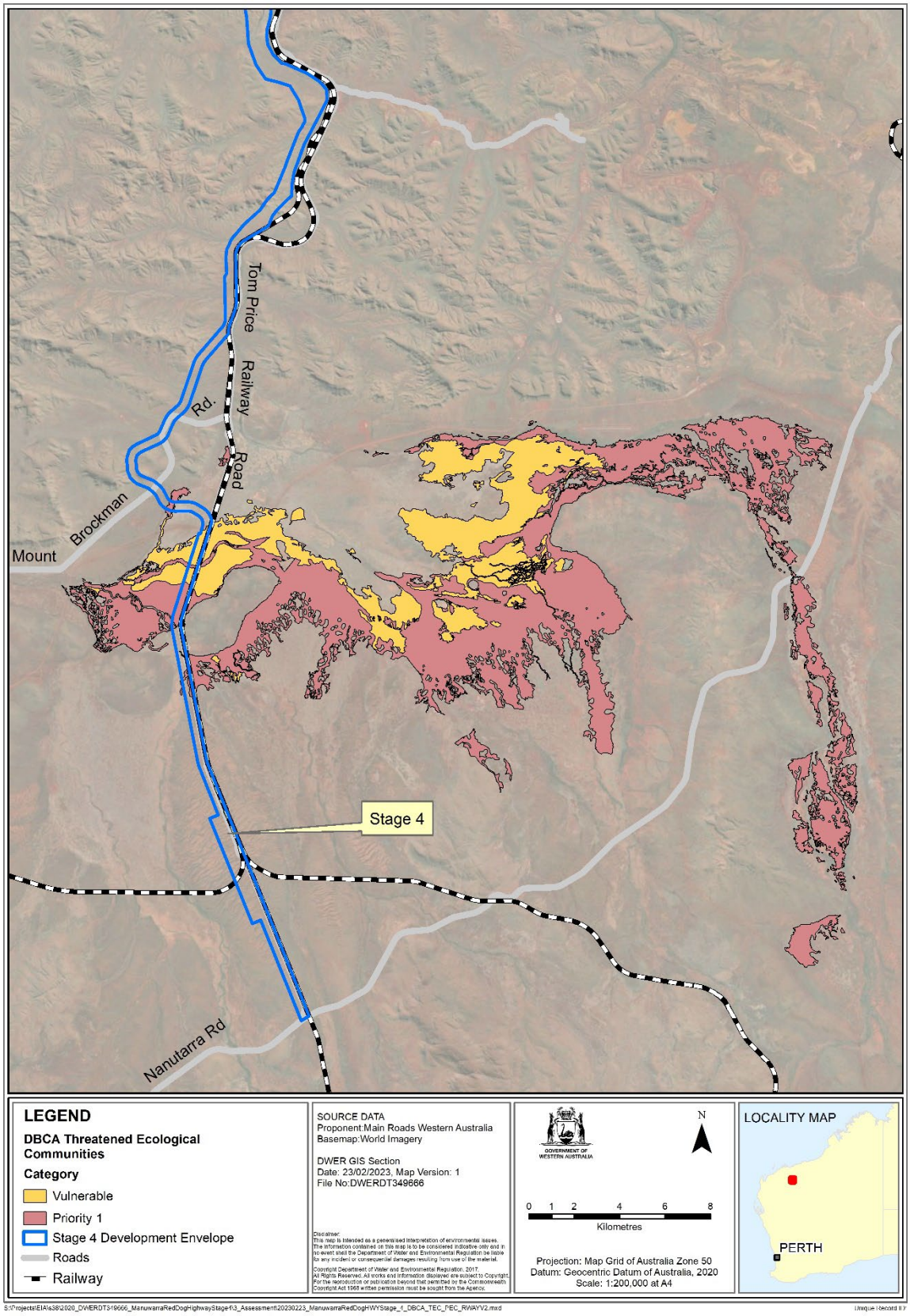

Figure 5. Extent of the Themeda grasslands TEC and Brockman Iron PEC mapped by DBCA within the local area.

2.2 Terrestrial fauna

2.2.1 Environmental objective

The EPA environmental objective for terrestrial fauna is *to protect terrestrial fauna so that biological diversity and ecological integrity are maintained* (EPA 2021b).

2.2.2 Investigations and surveys

The EPA advises the following surveys were used to inform the assessment of the potential impacts to terrestrial fauna:

- Manuwarra Red Dog Highway SRE Fauna Desktop Study (appendix 3 of the environmental review document) (Biota 2022a)
- Manuwarra Red Dog Highway Stage 4 Biological Survey (appendix 2 of the environmental review document) (Biota 2022b).

2.2.3 Assessment context – existing environment

Approved proposal (Ministerial Statement 677)

Approximately 505 ha of native vegetation was cleared to complete construction of stages 2 and 3 of the approved proposal in accordance with Ministerial Statement 677. Terrestrial fauna was considered a relevant environmental factor for the approved proposal under the scope of Biodiversity. However, the potential impacts to individual species and their habitat were not detailed or quantified in the assessment of that proposal. The proponent has extrapolated information from historical vegetation mapping associated with the approved proposal to provide an estimate of terrestrial fauna habitat impacts for stages 2 and 3. These cumulative impacts have been considered under section of 2.2.9.

The proposal for the revised stage 4 proposes to clear an additional 657 ha within the 7,142 ha development envelope (Jacobs 2022a; Main Roads WA 2022b). The impacts to terrestrial fauna for this proposal are assessed below.

Fauna habitat

The proposal will impact 12 fauna habitat types as recorded during the survey, including grove mulga (MG), mulga woodland plain (MWP), *Acacia xiphophylla* shrublands over cracking clay (ASCC), mixed *Acacia* shrublands (ASM), grasslands plains with cracking clay (GPCC), floodplain (CP), mesas, caves, cliffs and free faces (HS), rocky hills and slopes with low open spinifex and scattered trees (RHS), *Eucalyptus* fringed major drainage lines (MDE), rocky gullies (RG), *Melaleuca* forest/major drainage lines (MDM), and man-made water bodies (MMW) (Biota 2022b).

The most common fauna habitat types recorded within the development envelope were mixed *Acacia* shrublands (1,659.2 ha), floodplains (17,786.6 ha), and

Eucalyptus fringed major drainage lines (1,233.2 ha), which together, account for approximately 69% of the total fauna habitat recorded in the development envelope (Biota 2022b). Habitat types associated with mesas, caves, rocky hills and gorges and drainage lines are of highest value to threatened fauna.

Most of the habitat types within the development envelope are unlikely to provide significant habitat for short-range endemic (SRE) invertebrates due to the lack of microhabitat opportunities. Drainage features (drainage lines, rocky gorges, and gullies) are considered the highest value habitat for invertebrate fauna, represented by the HS, MDE, RG, and MDM habitat types in the development envelope (Biota 2022a).

Significant fauna

Nine species of conservation significance were recorded or identified as likely to occur within the development envelope (Biota 2022b):

- northern quoll (*Dasyurus hallucatus*) listed endangered under the EPBC Act and BC Act
- Pilbara leaf-nosed bat (*Rhinonicteris aurantia* Pilbara form) listed vulnerable under the EPBC Act and BC Act (recorded)
- ghost bat (*Macroderma gigas*) listed vulnerable under the EPBC Act and BC Act (recorded)
- Pilbara olive python (*Liasis olivaceus barroni*) listed vulnerable under the EPBC Act and BC Act
- grey falcon (*Falco hypoleucos*) listed vulnerable under the BC Act (recorded)
- western pebble-mound mouse (*Pseudomys chapmani*) listed Priority 4 (DBCA) (recorded)
- northern short-tailed mouse (*Leggadina lakedownensis*) listed Priority 4 (DBCA)
- lined soil-crevice skink (*Notoscincus butleri*) listed Priority 4 (DBCA)
- peregrine falcon (*Falco peregrinus*) listed other specially protected fauna (DBCA).

2.2.4 Consultation

No comments were received during the public review period.

2.2.5 Potential impacts from the proposal

The proposal has the potential to significantly impact on terrestrial fauna from:

- loss of important habitat for conservation significant fauna species
- potential impacts to fauna from injury and/or mortality during construction and operation
- potential indirect impacts to fauna from habitat fragmentation, artificial light during construction, vibration, and noise emissions.

The desktop SRE invertebrate assessment did not identify any conservation significant species as having potential to be impacted by the proposal (Biota 2022a). Impacts to SRE invertebrates are considered unlikely to be material given the proponent's minimisation measures to retain high value habitat types (refer section 2.2.6 and 2.2.9). Given the linear nature of the road, habitat suitable for SRE invertebrates will continue to be present within the development envelope and the wider survey area post-construction. Therefore, this issue was not considered further in the assessment.

2.2.6 Avoidance measures

The proponent has designed the proposal to (Jacobs 2022a; Jacobs 2022c):

- avoid temporary clearing of areas of northern quoll (*Dasyurus* hallucatus) critical and important supporting habitat
- avoid clearing northern quoll denning habitat during the pouched/denning period for this species (overlaps with June to December breeding season)
- avoid clearing within 150m of caves showing evidence of ghost bat use.

2.2.7 Minimisation measures (including regulation by other DMAs)

The proponent has proposed measures to minimise impacts to terrestrial fauna (Jacobs 2022a; Jacobs 2022c):

- set limits of disturbance for important fauna habitat types, so that disturbance does not exceed:
    - 0.15 ha of mesas, caves, cliffs and free faces (HS) habitat type
    - 3.85 ha of rocky gullies (RG) habitat type
    - 86.7 ha of rocky hills and slopes with low spinifex and scattered trees (RHS) habitat type
    - 90.4 ha of *Eucalyptus* fringed major drainage lines and associated tributaries (MDE) habitat type
    - 0.03 ha of *Melaleuca* forest/major drainage lines (MDM) habitat type
    - 183.3 ha of Floodplains (CP) habitat type
- implement construction speed limits to minimise interactions with vertebrate fauna
- undertake preclearance surveys of northern quoll suitable denning habitat prior to clearing
- establish a 150 m no-go zone between ghost bat caves and construction activities
- management measures will be implemented to minimise impact to ghost bat if blasting is required within a 400 m activity buffer including the use of confined blasting techniques in accordance with a management plan

- implement displacement methods to encourage movement of western-pebble mound mouse away from construction activities, as per DBCA advice
- avoid the use of barbed wire fencing to minimise the risk of bat fatalities.

2.2.8 Revegetation measures

The proponent notes that 100 ha of temporary clearing will occur for borrow pits, laydowns, stockpiling areas, and ancillary infrastructure. The proponent has committed to progressively revegetate all temporarily cleared areas. To date, 137 ha has been rehabilitated for temporary clearing required for the construction of stages 2 and 3.

2.2.9 Assessment of impacts to environmental values

The EPA considered that the key environmental values for terrestrial fauna proposed to be impacted by the proposal are conservation significant fauna including northern quoll, ghost bat, Pilbara leaf-nosed bat, Pilbara olive python and grey falcon.

Fauna habitat

The proposal will impact all fauna habitat types recorded within the development envelope. The highest value fauna habitat to threatened terrestrial fauna are listed in Table 6 below.

The HS habitat type contains microhabitats such as rock crevices, shallow caves, and overhangs, that are important habitat features for northern quoll, ghost bat, Pilbara leaf-nosed bat and Pilbara olive python. This habitat type was recorded to be in ‘Excellent’ condition (Biota 2022b). Approximately 8.4 ha of this habitat type occurs within the development envelope, of which 0.15 ha (1.8%) is proposed to be cleared as part of the proposal (Jacobs 2023a).

Habitat types associated with drainage, including MDE, MDM and RG are likely to provide for a continuous fauna corridor along major drainage lines and gullies. This allows dispersal and connectivity of fauna over large distances. Habitat type MDM supports ephemeral pools (Biota 2022b), which can be used as water resources for dispersing and foraging fauna.

The other fauna habitat types recorded in the survey are of lower value for terrestrial fauna, given fewer microhabitat opportunities. These habitat types are widespread throughout the Pilbara region, and no threatened fauna species are likely to rely solely upon these.

The EPA considers that the significant residual impact from habitat loss can be regulated through recommended conditions B3-1 (setting limits to the extent of clearing for important fauna habitat) and counterbalanced by offsets (recommended condition B6) (section 4) to ensure the environmental outcome is likely to be consistent with the EPA objective for terrestrial fauna.

Table 6. Limits of disturbance to important fauna habitat types

Fauna habitat type	Extent mapped within development envelope (ha)	Limit of disturbance (ha)	Extent remaining within development envelope post-clearing (ha)
Floodplain (CP)	1,778.6	183.3	1,595.3 (89.7%)
Mesas, caves, cliffs and free faces (HS)	8.4	0.15	8.25 (98.2%)
Rocky hills and slopes with low open spinifex and scattered trees (RHS)	702.1	86.7	615.4 (87.6%)
Eucalyptus fringed major drainage lines and associated tributaries (MDE)	1233.1	90.4	1,142.7 (92.7%)
Melaleuca forest/major drainage lines (MDM)	21.2	0.03	21.17 (99.8%)
Rocky gullies (RG)	13.7	3.85	9.85 (71.9%)

Conservation significant fauna

Northern quoll

While the survey did not identify any evidence of northern quoll use, this species was identified as likely to occur within the development envelope given the presence of suitable habitat and historical nearby records (Biota 2022b). The suitable habitat for northern quoll was recorded in 'Excellent' condition (Biota 2022b). In the local context of this proposal, habitat critical to the survival of northern quoll is described as habitat that provides denning opportunities for the species, including rocky habitats such as ranges, mesas, breakaways and rocky gullies. Of the fauna habitat types recorded within the survey, HS and RG provide suitable denning habitat.

The proponent has aligned the indicative disturbance footprint to limit the extent of clearing required of the HS and RG habitat types, with a maximum 4 ha of clearing for these habitats proposed out of the 22.1 ha recorded within the development envelope (representing 17.4%) (Jacobs 2023a). The proponent notes that a study commissioned by FMG in 2018 estimated that 8,224 ha of potential northern quoll denning habitat occurs in the Pilbara bioregion. Therefore, the proposal will result in the loss of less than 0.1% of the predicted denning habitat in the Pilbara bioregion. While direct disturbance has been limited within these habitat types, there will be an increase in the risk of impact to northern quoll as a result of constructing a road adjacent to existing critical habitat.

Dispersal and foraging habitat associated with, or connecting populations, is important for the long-term survival of northern quoll and is also considered critical habitat (Commonwealth of Australia 2016). Specifically, the northern quoll referral guideline notes the importance of foraging or dispersal habitat within a 1 km buffer of

shelter habitat (DoE 2016). While no northern quolls were identified within the suitable denning habitat, supporting habitat occurring within 1 km of these habitat types is considered critical habitat as it connects suitable denning habitat.

To provide for some flexibility in the final road alignment, the proponent has set a maximum disturbance extent of 46.3 ha to critical northern quoll habitat (including the HS and RG habitat and a 1km buffer of supporting habitat around these) within the development envelope, based on an indicative disturbance footprint (Jacobs 2022a). The proponent has also set a maximum disturbance limit for supporting habitat of 134.85 ha (not including the 46.3 ha of critical habitat). Therefore, the total proposed impact to northern quoll critical and supporting habitat is 181.15 ha, out of 1978.5 ha of suitable habitat present within the development envelope (representing 9.1%) (Jacobs 2023a). These habitat types include HS, RG, RHS, MDE and MDM.

Ghost bat

The Biota (2022b) survey identified 3 caves with evidence of ghost bat use in the survey area, all within the RHS habitat type, these include:

- one cave with evidence of remains and scats within the development envelope, around 300 m outside of the indicative disturbance footprint
- one cave with evidence of scats, which may be a maternity roost, approximately 125 m outside of the development envelope
- one cave with evidence of scats approximately 100 m outside of the development envelope.

Ghost bats seasonally move between several caves or as dictated by weather conditions and/or foraging opportunities, and therefore require a range of cave sites for roosting (Bat Call WA 2022a). They disperse widely when not breeding but may concentrate in a small number of caves when breeding (Bat Call WA 2022ba).

Bats roosting in these caves during construction may be indirectly impacted by noise and vibration from blasting requirements, which can lead to abandonment. These indirect impacts will be further considered below under the ‘Indirect impact to terrestrial fauna” section of this report.

Several of the recorded fauna habitat types within the development envelope provide supporting habitat for roosting, foraging, dispersal, and drinking. These habitat types include HS, RG, RHS, MDE, CP, MDM and MMW. The proponent has set a maximum disturbance limit of 316.35 ha of supporting habitat for ghost bat (based on an indicative disturbance footprint), out of 3759.4 ha recorded in the development envelope (representing 8.4%).

Ghost bats are known to forage up to 12 km from diurnal roosts sites, therefore supporting (foraging) habitat within this range is of greater importance to the conservation of the species (Bat Call WA 2022a). The proponent proposes to clear up to 154.4 ha of supporting habitat within 12 km of the 3 ghost bat caves recorded during the survey, which is considered critical habitat (Jacobs 2023b). The conservation advice for this species emphasises the need to minimise the loss and modification to foraging habitat (TSSC 2016a).

Pilbara leaf-nosed bat

The Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) was recorded from calls at 2 locations within the survey area on 3 occasions. These locations represented areas of suitable foraging habitat. No caves suitable for roosting were recorded during targeted searches (Biota 2022b). However, given that calls were recorded, there may be roost caves within 20 km of the development envelope noting that Pilbara leaf-nosed bat is most likely encountered within 20 km of permanent diurnal roosts upon which distance they may forage from roost caves (Bat Call WA 2022b).

The conservation advice for this species has categorised priority levels for foraging habitat (from Priority 1 to Priority 5) (TSSC 2016b). There is no Priority 1 or Priority 2 habitat types within the development envelope. However, several of the recorded fauna habitat types within the development envelope provide lower priority supporting habitat for roosting, foraging, dispersal, and drinking for the species. The proponent has set a maximum disturbance limit of 181.15 ha of supporting habitat for Pilbara leaf-nosed bat, out of the 1,978.5 ha recorded in the development envelope (representing 9.1%). As per the conservation advice for ghost bat, there is an emphasis on minimising the loss and modification to foraging habitat (TSSC 2016b).

Pilbara olive python

The survey did not identify any evidence of Pilbara olive python (Biota 2022b). However, this species is considered likely to occur in the development envelope given the presence of suitable habitat, including excellent quality habitat along the major drainage lines, and historical nearby records. The closest historical records are around 4 km west of the development envelope where it deviates around Hamersley Homestead (Jacobs 2022a). There are also known important populations in the vicinity of the development envelope in the Tom Price and Millstream areas.

Preferred habitat for the Pilbara olive python includes gorges, escarpments, rocky outcrops, and water holes where it may find suitable prey. It is commonly associated with areas holding ephemeral or permanent water; however, individuals have large home ranges (estimated between 88 ha and 449 ha) and may be recorded in rocky habitats some distance from such features (Biota 2022b). While there are no permanent pools or gorges within the development envelope that would provide critical habitat, several of the recorded fauna habitat types provide supporting habitat suitable for foraging, dispersal and drinking. The most significant of these is likely MDM, noting the presence of ephemeral pools in this habitat type (Biota 2022b).

The proponent has set a maximum disturbance limit of 316.15 ha of supporting habitat for Pilbara olive python (including 0.03 ha of MDM), out of the 3,757.5 ha recorded in the development envelope (representing 8.4%). This includes 0.03 ha of MDM out of a total 21.2 ha recorded in the development envelope (representing 0.14%).

Grey falcon

This species commonly occurs on lightly wooded plains and along major watercourses where it breeds within taller trees. One grey falcon was recorded

foraging within the survey area (Biota 2022b). Noting that habitat for this species is widespread and common in the Pilbara region, the development envelope is not likely to provide significant habitat for this species.

The EPA considers that taller trees identified along the *Eucalyptus* fringed major drainage lines and associated tributaries (MDE) habitat type may provide suitable breeding habitat for this species. Therefore, there is a risk of impact to breeding grey falcons should clearing occur within the nesting season between 1 June–30 November.

The EPA considers that the residual impact to this species is unlikely to be significant subject to recommended condition B3-2, requiring a pre-clearance survey of suitable grey falcon breeding trees, and if identified, avoid clearing until the tree is no longer occupied. This recommended condition is consistent with that required under the Department of Climate Change, Energy, the Environment and Waters (DCCEEW) approval of this proposal. This condition would ensure consistency with the EPA objective for terrestrial fauna.

Short-tailed mouse, lined soil-crevice skink, peregrine falcon and western pebble-mound mouse

The northern short-tailed mouse, lined soil crevice skink and the peregrine falcon are all known to occur in the local area but were not recorded during the Biota (2022b) survey. Noting these species occupy a range of habitat types, and that these habitat types are generally common and widespread within the Pilbara region, the development envelope is unlikely to provide significant habitat for these species. While the peregrine falcon is highly mobile and can move away from construction activities, there is a risk of direct impact to short-tailed mouse and lined soil-crevice skink individuals should they occur within the development envelope during construction activities.

The Western pebble-mound mouse was recorded from 4 mounds during the survey (Biota 2022b). Two of the mounds were active, and 2 inactive. These mounds are within the development envelope, but not within the indicative disturbance footprint (Biota 2022b). Suitable habitat for this species is common and widespread within the Pilbara region, and the development envelope is unlikely to provide significant habitat for this species. However, there is a risk of direct impact to individuals utilising active mounds within the development envelope during construction activities, should the indicative disturbance footprint change. The proponent has committed to creating a 50 m no-go zone between construction activities and known active burrows for this species that are located outside of the final disturbance footprint (Jacobs 2022a).

The EPA considers that the residual impact to these species is unlikely to be significant and can be regulated through recommended conditions B3-4 and B3-13 that require fauna spotters and construction speed limits. The proponent has also committed to undertaking displacement methods should active western pebble mouse mounds be required for disturbance, in line with methods previously endorsed by DBCA (Jacobs 2022a). These measures would ensure consistency with the EPA objective for terrestrial fauna.

Significant residual impact

The EPA has assessed the likely significant residual impacts of the proposal on threatened fauna to be:

- loss of up to 46.3 ha of critical habitat for northern quoll (being suitable denning habitat (4 ha) and supporting habitat with 1 km of suitable denning habitat)
- loss of up to 134.85 ha of supporting habitat (foraging and dispersal) for northern quoll (outside of the critical habitat referred to above)
- loss of up to 154.4 ha of critical habitat (suitable habitat within 12 km of identified potential roost caves) for ghost bat
- loss of up to 161.95 ha of supporting habitat (foraging, dispersal and/or drinking) for ghost bat (outside of the critical habitat referred to above)
- loss of up to 181.15 ha of supporting habitat (foraging, dispersal and/or drinking habitat) for Pilbara leaf-nosed bat
- loss of up to 316.15 ha of supporting habitat (roosting, foraging, drinking) for Pilbara olive python.

The EPA considers that the significant residual impact to threatened fauna can be regulated through recommended condition B3-1, which sets disturbance limits for critical and supporting habitat for threatened fauna, and that the loss of significant habitat can be counterbalanced by offsets (recommended condition B6) (section 4). These conditions would ensure the environmental outcome is likely to be consistent with the EPA's objective for terrestrial fauna.

Other impacts to threatened terrestrial fauna

Fauna mortality or injury

The EPA considers that there is risk of fauna mortality or injury from the proposal. To minimise this impact to northern quoll, the proponent has committed to undertaking pre-clearance surveys within its suitable denning habitat, to identify the presence of northern quoll individuals. To ensure this commitment is adhered to, the EPA has recommended condition B3-3 to require the proponent to undertake pre-clearance surveys and delay or cease construction activities if individuals are identified, thus allowing individuals to move away or be relocated from the disturbance area. The EPA also recommends condition B3-4(1) requiring the presence of fauna spotters during clearing activities to minimise impacts to terrestrial fauna species (including requirement to relocate Pilbara olive python if identified). These recommended conditions are consistent with those required under DCCEEWs conditional approval of the proposal, and with those recommended during EPAs assessment of the Ashburton Infrastructure Project (Report Number 1733). The recommended conditions would ensure consistency with the EPA objective for terrestrial fauna.

During construction and operation, there is a risk of threatened fauna being struck by vehicles, particularly noting that the road will intersect suitable denning habitat for northern quoll. Northern quolls are nocturnal and therefore dispersal activities will be

higher during night-time hours. The EPA considers that the risk of fauna mortality or injury from vehicle strike during construction can be minimised and managed through recommended conditions B3-6, B3-7, and B3-13, which requires no clearing of northern quoll suitable denning habitat during its breeding season, no clearing within its critical habitat at night, and construction speed limits (80 km/hr day-time all areas, 60 km/hr night-time all areas and 40 km/hr night-time within northern quoll critical habitat).

The above speed limits are consistent with those required under DCCEEWs conditional approval of the proposal, for areas outside of northern quoll critical habitat. The more restrictive (than DCCEEW) 40 km/hr night-time limit within northern quoll critical habitat is considered necessary given the higher risk of this nocturnal species being active at night. This largely aligns with the EPAs recommended conditions for the Ashburton Infrastructure Project, requiring a 40 km/hr speed limit within northern quoll critical habitat during all times (not just at night). The slightly more restrictive condition was deemed necessary for the Ashburton Infrastructure Project given the high density of northern quolls recorded within the adjacent denning habitat. The EPA considers that construction speed limits will reduce the risk of fauna fatalities for all species, not only northern quoll. These conditions would ensure consistency with the EPA objective for terrestrial fauna.

The EPA considers that vehicle strike from construction presents more of an acute risk than vehicle strike from operation of the highway, noting it is initial disturbance to undisturbed fauna habitat. This is also noting the proponent's advice that based on traffic volume monitoring, traffic volumes will likely be low with an expected maximum of 635 vehicles per day, with lower volumes expected at night (Jacobs 2022a) (fewer tourist vehicles), reducing the risk to northern quoll from vehicle strike. The EPA recommends condition B3-11 to require the proponent to install signage on both sides of the road within northern quoll critical habitat prior to operation, to alert road users to the likelihood of encountering northern quoll. This condition would ensure consistency with the EPA objective for terrestrial fauna.

The proponent notes that fencing may be required along some of the road to protect road users, at the request of landowners, or for other health, safety, and environmental reasons. The proponent notes that the type of fencing installed is expected to allow for small and medium sized fauna to move through (Jacobs 2022a). The proponent has committed to not using any barbed wire fencing, and to installing discs/tags on fencing to make visible for fauna, particularly bats (Jacobs 2022a). The EPA considers that the risk of mortality and injury to bats can be minimised through recommended condition B3-12 that requires the use of any barbed wire fencing to be installed with bat deflectors and the top strand as a single wire. This condition would ensure consistency with the EPA objective for terrestrial fauna.

The EPA considers that through recommended conditions to manage clearing, road fence design, vehicle speed limits, signage and lighting, the proposal can be managed to align with the recovery plan of northern quoll, and conservation advice for ghost bat and Pilbara leaf-nosed bat, (Hill and Ward 2010, TSSC 2016a, TSSC 2016b). These conditions will minimise adversely impacting individuals and causing

local population decline of these species, to be consistent with the EPA objective for terrestrial fauna.

Northern quoll habitat fragmentation

The northern quoll recovery plan emphasises the importance of managing northern quoll populations to prevent fragmentation and genetic isolation (Hill and Ward 2010). The development envelope intersects areas of suitable denning habitat. Therefore, while northern quoll was not recorded within the development envelope, the road may impede fauna movement between areas of critical habitat.

A recent northern quoll monitoring program (Harewood 2022) undertaken for the proponents Coongan Gorge Realignment project identified that installing culverts is successful in minimising fragmentation impacts on northern quoll. This is based on evidence of culvert use by the species. Specifically, in 286 cases (out of 633 northern quoll recordings), northern quoll individuals were deemed to have passed through culverts, with 14 out of 15 culverts monitored showing evidence of use (Harewood 2022).

The proponent notes that it integrates a high number of culverts during road design to maintain surface water flows and advised that numerous culverts will be used for waterway crossing throughout the stage 4 alignment (Jacobs 2022a). There are several minor watercourses intersected by the road alignment in the area of northern quoll critical habitat, and it is expected that culverts will be installed within close proximity to this habitat to allow for maintenance of existing surface water flows. Such culverts would allow northern quoll to safely traverse the road. The EPA also notes the proponent's advice around expected low traffic volumes, particularly at night, where opportunities will exist for northern quoll to cross the relatively narrow road infrastructure with low risk of fauna strike. The EPA considers that based on the above, the impact of fragmentation to northern quoll is likely to be consistent with the EPA objective for terrestrial fauna.

Blasting disturbance

The proponent has advised that blasting may be required in areas of cut which cannot be excavated by standard earthmoving machinery (Jacobs 2022a). Blasting activities within close proximity to ghost bat roost caves have the potential to indirectly impact on ghost bats through noise and vibration, which can lead to the abandonment of caves.

The proponent has committed to maintaining a 150 m no-go zone for any activities around the 3 identified ghost bat caves (Jacobs 2022a). The proponent notes that this buffer distance has been informed by a Biota study which measured blasting vibration levels and bat behavioural responses within a Pilbara leaf-nosed bat roost cave for Rio Tinto's Koodaideri mine. The study tested a blast distance of 160 m from the centre of the cavern where the bats were roosting (Jacobs 2022a). Minimal evidence of disturbance behaviour was detected, indicating the suitability of such a buffer to avoid bat disturbance and potential cave abandonment. The proponent

notes that blasting will occur intermittently along the road route and will not be concentrated in one specific area for extended periods (Jacobs 2022a).

The proponent has also committed to preparing a noise and vibration management plan for any blasting required within 400 m of the recorded ghost bat caves (outside of the 150 m proposed no-go zone). The plan would establish a threshold for peak particle velocity and noise values for each blast based on fauna specialist consultation, and noise and vibration monitoring measures to make sure roosting bats are not being disrupted by blasting activities (Jacobs 2022a).

The EPA considers that the risk of indirect impacts to roosting ghost bats can be regulated through recommended conditions B3-8, B3-9 and B3-10, requiring a 200 m buffer from ghost bat caves for construction activities, limiting blasting to day-time hours, and the preparation of a noise and vibration management plan in the event blasting is required within 500 m of ghost bat caves. The recommendation for conditions requiring a 200 m construction activity buffer to ghost bat caves and a management plan should blasting occur within 500 m of ghost bat caves is consistent with the conditions of DCCEEWs approval of the project. These conditions would ensure consistency with the EPA objective for terrestrial fauna.

It is noted that the 200 m construction activities buffer is more expansive than buffers previously required by EPA in projects occurring within close proximity to ghost bat caves. However, noting the abovementioned Biota bat behavioural study referred to by the proponent, which deemed a 160 m buffer was appropriate, the limited available information on ghost bat buffers to blasting, and that the proponent has committed to the larger buffer and requested consistency with DCCEEWs condition, it is considered appropriate in this instance to require these buffers under the recommended conditions.

Lighting

The proponent has advised that there is no permanent lighting proposed for stage 4 of the proposal (Jacobs 2022a), outside of any lighting that may be required for safety reasons or under legislation. Temporary artificial lighting will be used during construction, and this may indirectly impact on nocturnal activities of threatened fauna. The proponent notes that temporary lighting will not remain in one place for long periods and will move along the road route as construction progresses (Jacobs 2022a).

The EPA considers that the risk of indirect impacts from artificial light can be managed through recommended condition B3-14, requiring no permanent lighting within the stage 4 development envelope (unless required for safety or under other legislation) and all required artificial lighting used during construction activities must use directional and/or shielded lighting and avoid light spill within northern quoll critical habitat or within 500 m of ghost bat caves. This condition would ensure consistency with the EPA objective for terrestrial fauna

Altered surface water flows and introduction and spread of weeds may impact the quality of fauna habitat through vegetation degradation. Potential indirect impact to vegetation (fauna habitat) is assessed under flora and vegetation (section 2.1).

Cumulative impact assessment

The proponent has assessed the cumulative effects by considering the impacts of the proposal with completed stages 2 and 3, and additional projects within the local area, as detailed below. The EPA's cumulative impact assessment has considered: cumulative effects due to the range of impacts and pressures in the area affected by the proposal; and whether the environment affected by the proposal has significant value due to other successive, incremental, and interactive cumulative impacts in the assessment area. It is considered that the cumulative impacts to significant fauna habitat are not at a level that would warrant a decision to allow no further clearing of these values for this proposal. However, mining and infrastructure development impact pressures in the region and local area are such that the EPA must consider and appropriately manage the incremental loss of these values. The detailed assessment of cumulative impacts to these values is presented below.

Stages 2 and 3 of the Manuwarra Red Dog Highway Project

To date, around 505 ha of native vegetation has been cleared under Ministerial Statement 677 to construct stages 2 and 3 of the proposal. This includes 137 ha of temporarily cleared areas that have been rehabilitated, in accordance with a vegetation protection and rehabilitation management plan. Of the vegetation cleared under stage 2 and 3:

- none comprised critical habitat for northern quoll
- 48.1 ha comprised supporting habitat for northern quoll and Pilbara leaf-nosed bat
- 64.2 ha comprised supporting habitat for ghost bat and Pilbara olive python.

Therefore, the cumulative impact on threatened fauna from stages 2, 3 and 4 is:

- 229.25 ha of supporting habitat for northern quoll
- 229.25 ha of supporting habitat for Pilbara leaf-nosed bat
- 380.35 ha of supporting habitat for Pilbara olive python
- 380.55 ha of supporting habitat for ghost bat.

Related projects within the local area

The EPA has assessed the cumulative effects by considering the impacts of the proposal in addition to the following related approved projects (by virtue of their relatively close proximity), including Eliwana Rail project, Eliwana Iron Ore Mine project and Solomon Iron Ore Mine project. The impact of each project on fauna habitat values consistent with the proposal are shown in Table 7.

Table 7. Cumulative fauna habitat impacts of projects in the local area

Environmental value being impacted	Eliwana Rail Project impact	Eliwana Iron Ore Mine Project impact	Solomon Iron Ore Mine Project impact	Cumulative impact
Northern quoll	5 ha of suitable denning habitat 360 ha of foraging and dispersal habitat.	36 ha of suitable denning habitat 998.9 ha of foraging and dispersal habitat.	129 ha of suitable denning habitat 3,106 ha foraging and dispersal habitat.	170 ha of suitable denning habitat 4,464.9 ha of foraging and dispersal habitat.
Ghost bat	0.3 ha of critical habitat (gorges and gullies) Supporting habitat not quantified.	36 ha of critical habitat (gorges and gullies) Supporting habitat not quantified.	421 ha foraging habitat.	36.3 ha of critical habitat 421 ha foraging habitat (minimum).
Pilbara leaf-nosed bat	0.3 ha of critical habitat (gorges and gullies) Supporting habitat not quantified.	36 ha of critical habitat (gorges and gullies) Supporting habitat not quantified.	421 ha foraging habitat.	36.3 ha of critical habitat 421 ha foraging habitat (minimum).
Pilbara olive python	Supporting habitat not quantified.	36 ha of critical habitat (gorges and gullies) 539.5 ha of drainage lines/river/creek (Major) habitat.	3,106 ha of supporting habitat.	3,645.5 ha of supporting habitat 36 ha of critical habitat.

The EPA considers that on a bioregional scale, implementation of this proposal would contribute to cumulative impacts to the abovementioned threatened fauna species, through habitat loss. As assessed in this section, the proposal is likely to constitute a significant residual impact to fauna habitats.

Cumulatively, the impacts are not to a level that would alter the likely environmental outcomes of this proposal. This is noting the extent of vegetation remaining in the Pilbara Bioregion which contains an estimated 17,731,764 ha of native vegetation (Government of Western Australia 2019). This conclusion also considers the location of northern quoll critical habitat within the development envelope relative to the abovementioned projects and likely presence of critical habitat in the local area. Specifically, the EPA notes that there is extensive mesa habitat that extends immediately west and east of the proposal location for several kms, which has not been impacted on, or bisected by development, and will likely offer high quality denning habitat for northern quoll free of disturbance.

Should this proposal be approved with EPA's recommendation for offsets (section 4), it will combine with offset contribution from other projects in the bioregion, to deliver offset projects through the Pilbara Environmental Offsets Fund to provide environmental benefits within the Pilbara.

2.2.10 Summary of key factor assessment and recommended regulation

The EPA has considered the likely residual impacts of the proposal on terrestrial fauna values. In doing so, the EPA has considered whether reasonable conditions could be imposed, or other decision-making processes can ensure consistency with the EPA factor objective. The EPA assessment findings are presented in Table 8.

The EPA has also considered the principles of the EP Act (see Appendix C) in assessing whether the residual impacts will be consistent with its environmental factor objective and whether reasonable conditions can be imposed (see Appendix A).

The EPA also notes that the proponent would be required to obtain ministerial authorisation to take or disturb threatened fauna in accordance with the BC Act.

Table 8: Summary of assessment for terrestrial fauna

Residual impact or risk to environmental value	Assessment finding or Environmental outcome	Recommended conditions and DMA regulation
<u>Proposal</u> Direct impact to the following habitat types that are of importance to threatened fauna: • 0.15 ha of mesas, caves, cliffs and free faces (HS) • 3.85 ha of rocky gullies (RG) • 86.7 ha of rocky hills and slopes with low spinifex and scattered trees (RHS) • 90.4 ha of *Eucalyptus* fringed major drainage lines and associated tributaries (MDE) • 0.03 ha of *Melaleuca* forest/major drainage lines (MDM). • 183.3 ha of Floodplains (CP)	The EPA considers that the proposed impact to important habitat for threatened fauna is a significant residual impact. The EPA advises that subject to the recommended conditions requiring clearing limitations to important threatened fauna habitat, and offsets to counterbalance the significant residual impacts, the environmental outcome is likely to be consistent with the EPA objective for terrestrial fauna.	**Condition B3 (Terrestrial fauna)** Sets limits of disturbance to important fauna habitat types. **Condition B6 (Offsets)** Contribution to the Pilbara Environmental Offsets Fund for clearing threatened fauna habitat.

Residual impact or risk to environmental value	Assessment finding or Environmental outcome	Recommended conditions and DMA regulation
<u>Combined effect (with stages 2 and 3)</u> • No critical habitat for northern quoll was impacted under stages 2 and 3 • 48.1 ha of supporting habitat for northern quoll and Pilbara leaf-nosed bat was impacted under stages 2 and 3 • 64.2 ha of supporting habitat for ghost bat and Pilbara olive python was impacted under stages 2 and 3. Given the above, the combined impact on each species habitat is: • 229.25 ha of habitat for northern quoll, including 46.3 ha of critical habitat • 229.25 ha of supporting habitat for Pilbara leaf-nosed bat • 380.35 ha of supporting habitat for Pilbara olive python • 380.55 ha of habitat for ghost bat including 154.4 ha of critical habitat.		
<u>Proposal</u> Impact to threatened fauna through machinery strike (clearing and construction) and fence collision. <u>Combined effect</u> The combined effect with stages 2 and 3 is unlikely to have a significant impact on conservation significant fauna species noting the long distance that the linear road infrastructure extends over.	These residual impacts are likely to be regulated through recommended conditions requiring construction vehicle speed limits, pre-clearance surveys, timing limitations on clearing, signage, and specifications for barbed wire fencing. The EPA also notes the proponent's commitment to undertake displacement methods should active western pebble mouse	**Condition B3 (Terrestrial fauna)** Pre-clearance surveys (northern quoll and grey falcon) and engage fauna spotters during clearing. Set construction speed limits (including specific limits on sections of the road nearby high-value fauna habitat).

Residual impact or risk to environmental value	Assessment finding or Environmental outcome	Recommended conditions and DMA regulation
	mounds be required for disturbance, in line with methods previously endorsed by DBCA. These measures and the recommended conditions would ensure consistency with the EPA objective for terrestrial fauna.	Specifications for the use of barbed wire fencing and ensure use of bat deflectors on any barbed wire fencing required. Install road signage within northern quoll critical habitat. No clearing within northern quoll critical habitat at night, or within suitable denning habitat during the breeding season. **DMA legislation** The proponent will need to obtain Ministerial authorisation under the BC Act to take or disturb threatened fauna.
<u>Proposal</u> Indirect impact to northern quoll through habitat fragmentation and artificial light, and to ghost bats from artificial light, vibration, and noise emissions. <u>Combined effect</u> Noting that no ghost bat roost caves, Pilbara leaf-nosed bat roost caves, or northern quoll critical habitat was identified within the development envelope of stages 2 and 3, the combined effect of this impact is not likely to be significant.	The EPA advises that these residual impacts are likely to be regulated through recommended conditions requiring no-go and blasting activity buffers to ghost bat caves and lighting restrictions. The EPA has considered the proponent's advice regarding a recent study indicating frequent use of culverts by northern quoll as a road underpass, which limits fragmentation. The EPA understands that culverts will be installed throughout the alignment. The EPAs above recommended conditions ensure consistency with the EPA objective for terrestrial fauna.	**Condition B3 (Terrestrial fauna)** No blasting to occur during the night-time or within 200 m of the three caves showing evidence of ghost bat use within the development envelope. Should blasting be required within 500 m of caves showing evidence of ghost bat use, prepare and implement a noise and vibration management plan to establish noise and vibration limits and monitor disturbance to ghost bats within the cave. No permanent lighting within the development envelope (unless required for safety/under

Residual impact or risk to environmental value	Assessment finding or Environmental outcome	Recommended conditions and DMA regulation
		legislation) and all artificial lighting used during construction must be directional/shielded.

2.3 Inland waters

2.3.1 Environmental objective

The EPA environmental objective for inland waters is *to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected* (EPA 2021b).

2.3.2 Investigations and surveys

The EPA advises the following investigations were used to inform the assessment of the potential impacts to inland waters:

- Fortescue River, Weelamurra Creek and Caves Creek Waterways Summary Report (waterways summary report) (appendix 4 of the environmental review document) (Cardno 2022)
- Hydrological risk assessment for Manuwarra Red Dog Highway (Stage 4) (appendix C of the response to submissions document) (WSP Golder 2022).

2.3.3 Assessment context – existing environment

Approved proposal (Ministerial Statement 677)

The approved proposal intersected the Harding Dam Catchment Area (Priority 1) Public Drinking Water Source Area (PDWSA) (associated with stage 2) and the Millstream Water Reserve PDWSA (Priority 1 and 2) (associated with stages 3 and 4). The section of the highway within the Harding Dam Catchment Area has been constructed and is operational. Impact to watercourses was considered a relevant environmental factor for the approved proposal under ‘surface drainage’.

Under Ministerial Statement 677, the proponent was required to prepare a surface drainage management plan that included management strategies for protecting water quality in the Harding Dam and Millstream Water Reserve PDWSA (commitment 2 of Ministerial Statement 677). The proponent has achieved compliance with the management plan for stage 2, however, there are ongoing monitoring measures in the plan that are still required for stage 3.

The proposal for the revised stage 4 proposes to disturb an additional 657 ha within a development envelope of 7,142 ha (Jacobs 2022a; Main Roads WA 2022b). The impacts to inland waters for this proposal are referred to below.

Groundwater and surface water

In assessing this proposal on inland waters, the EPA has had regard to the fact that there are other existing infrastructure proposals near this proposal, and hence hydrological regimes have already been impacted and disrupted to varying degrees. An important objective of the assessment on inland waters is that this proposal maintains and does not further exacerbate interruption to water regimes, particularly downstream of existing infrastructure.

The proposal is located within the Pilbara Groundwater and Pilbara Surface Water Areas, both proclaimed under the RIWI Act. The proposal occurs within the Millstream-Chichester Water Reserve within the Ashburton River Catchment. A small portion of the stage 4 alignment occurs within the Priority 1 area of the Millstream Water Reserve PDWSA, the majority occurs within the Priority 2 area.

Water required for the construction of stage 4 is estimated to be between 148,000 and 412,000 kL over the 30-month construction period. Existing licensed Rio Tinto bores occur along the majority of the development envelope. The proponent advises that they are currently investigating options for water supply to utilise some of these existing bores (Jacobs 2022a).

The proposal has the potential to impact major watercourses including the Fortescue River, Weelamurra Creek and Caves Creek; other minor watercourses including Cowcumba Creek/Tunkawanna Creek, Ballyeerina Creek and Barnett Creek; and many ephemeral drainage lines associated with these watercourses.

Hydrological characteristics of note identified in the waterways summary report are the high flow depths where the highway will cross Fortescue River, the braided flows and narrow widths in Weelamurra Creek that may require complex road crossings, water levels in the floodplain in the vicinity of the Fortescue Metals Group Eliwana railway crossing, and the confluence of flows of Barnett Creek and Caves Creek (Cardno 2022). Furthermore, the Weelamurra Creek flow is modified by the presence of the Rio Tinto levees that direct flow away to protect the Rio Tinto rail line. As part of the proposal, the proponent proposes to realign stage 4 to be situated entirely on the western side of the Rio Tinto rail line.

The hydrogeological assessment identified that the vegetation growing in association with the abovementioned watercourses have potential of being GDV (WSP Golder 2022). Impacts to GDV is assessed in section 2.1 of this report.

2.3.4 Consultation

No comments were received during the public review period.

2.3.5 Potential impacts from the proposal

The proposal has the potential to significantly impact on inland waters from (Jacobs 2022a):

- groundwater drawdown as a result of groundwater abstraction and dewatering during construction
- disturbance of bed and banks of watercourses during construction
- permanent changes to existing surface water flows resulting in shadowing, flooding and/or waterlogging
- decrease in groundwater and surface water quality due to increased sediment load caused by erosion, dewatering, accidental hydrocarbon or chemical spills, and contaminated operational run-off.

The potential indirect impacts to groundwater or sheet flow dependent vegetation and Aboriginal cultural heritage as a result of impacts to inland waters is assessed in sections 2.1 and 2.4. respectively.

2.3.6 Minimisation measures (including regulation by other DMAs)

The proponent has proposed measures to minimise impacts to inland waters:

- road and drainage design will be developed to maintain the existing hydrological regime
- reinstate or protect the banks of watercourses as required to reduce the risk of erosion
- install silt curtains into watercourses when working over or in waterways to limit sedimentation impacts
- road alignment selected to generally maintain the direction of existing surface water flows in areas where grove-intergrove Mulga communities are present
- bulk storage of chemicals and hydrocarbons to only occur at construction compounds.

The EPA notes that under the RIWI Act, the proponent will need to obtain a permit to interfere with the bed and banks of a watercourse and obtain appropriate groundwater licences to construct or alter a well, and take water.

2.3.7 Revegetation measures

All temporary cleared areas for construction, such as laydowns, stockpiling areas and areas cleared for ancillary infrastructure will be revegetated (Jacobs 2022a).

2.3.8 Assessment of impacts to environmental values

The EPA considers that the key environmental values for inland waters proposed to be impacted are:

- groundwater levels from abstraction and dewatering during construction
- surface water flows
- groundwater and surface water quality.

Groundwater drawdown

The EPA has assessed that the likely residual impacts to inland waters from the proposal includes groundwater drawdown from abstraction and dewatering, required during construction.

A hydrogeological risk assessment reviewed 4 groundwater abstraction scenarios, including 2 scenarios where 78% of the water is supplied by existing licensed Rio Tinto bores. The assessment looked at drawdown at distances of 100 m, 500 m and 1000 m from a potential well location. The assessment considered the worst-case scenario and assumed no recharge over the pumping period (WSP Golder 2022).

The greatest groundwater drawdown was estimated for the scenario where 100% of the water requirements were supplied by the proponent from one well. Groundwater drawdown for this scenario was estimated as ranging from a minimum of 0.07 m (within CID aquifers) to a maximum of 0.37 m (within fractured rock aquifers) at a distance of 100 m from the well, and a minimum of 0.04 m (within CID aquifers) to a maximum of 0.19 m (within fractured rock aquifers) at a distance of 500 m from the well (WSP Golder 2022).

The results indicate that, even at a distance of 100 m from the well and assuming no recharge over the pumping period, impacts of drawdown from groundwater abstraction are predicted to be low (WSP Golder 2020). The proponent notes that unlike the modelled worst-case scenario, abstraction would occur over several well locations along the alignment (Jacobs 2022a). The proponent further notes that it plans to obtain construction water from existing licensed Rio Tinto bores (within their allocated and approved licensed extraction rates) for the northern portion (78%) of the 112 km proposed stage 4 alignment. The proponent has committed to developing a Groundwater and Surface Water Operating Strategy to minimise impact of groundwater drawdown.

Bridges will be required as part of the proposal and may require dewatering during construction. If required, the dewatering rate is expected to be high between 50 L/s to 100 L/s. Groundwater drawdown is predicted to be around 0.5 m at a distance of 100 m from the excavation, extending up to 800 m from the excavation (WSP Golder 2022). The proponent proposes to control the location of dewatering so that it occurs between the extraction site and areas of environmental value, or as close to the groundwater extraction site as possible. This will ensure that groundwater can be infiltrated back into the groundwater aquifer. Some groundwater volume will be lost through this process, however, net abstraction volume from the groundwater aquifer is likely to be minimal (Jacobs 2022c; WSP Golder 2022). Furthermore, the EPA has considered that any dewatering will be of short duration, approximately 2 months at each bridge location, and to a maximum depth of no more than 5 m below ground (WSP Golder 2022). With proper management, dewatering required for the proposal is likely to have minor and temporary effect on the local groundwater system.

Semi-permanent and permanent pools occur within the Weelamurra Creek, which are highly important to the Yinjibarndi and Wintawari Guruma Peoples (see additional information under section 2.4 Social Surroundings). The proponent

commits to avoid developing new supply bores within close proximity to Weelamurra Creek or any associated pools (Jacobs 2022c).

The EPA has considered that groundwater abstraction and dewatering will only be required during construction (30-month period) and any drawdown caused by these activities will be temporary. The EPA also notes that the proponent will need to obtain appropriate water licences in accordance with the RIWI Act to undertake groundwater abstraction and dewatering activities. The EPA considers that the risk of groundwater drawdown can be adequately managed through recommended conditions B2-1(4) and B4-1(3) to ensure no adverse impacts to GDVs or permanent or semi-permanent pools present within Weelamurra Creek, so that the proposal is likely to be consistent with the EPA objective for inland waters.

Changes to existing surface water flows

The presence of the road has the potential to impede existing surface water flows resulting in shadowing, flooding, and waterlogging, if unmanaged. This risk is particularly relevant to Weelamurra Creek, Barnett Creek and Caves Creek and their associated significant drainage lines which intersect or occur adjacent to the development envelope. While the development envelope also intersects the Fortescue River, the EPA considers that the proposed road, which is expected to be constructed with a floodway at this location, is unlikely to significantly impact on the high velocity flows that this expansive river system is subject to.

The EPA has considered that changes to existing surface water flows can have indirect impacts on Aboriginal cultural heritage (see section 2.4), conservation significant ecological communities, and locally significant vegetation including GDVs and mulga communities (see section 2.1).

The baseline modelling of surface water flows indicates that the proposal interacts with large and complex catchments (Cardno 2022). The proponent advises that up to 9 bridges may be required to cross major waterways (Jacobs 2022a). The proponent intends to base bridge and culvert design on the baseline modelling, to ensure that surface water management structures have sufficient capacity to maintain existing surface water flows (Jacobs 2022c).

Regarding the risk of surface water flow changes impacting permanent and semi-permanent pools of Weelamurra Creek, the EPA notes that these pools are located outside and upstream (east) of the development envelope of the proposal. The EPA considers that the proposal is not likely to have any upstream impacts on watercourses from changes to surface water flows.

The EPA recommends conditions B2-1(4), B4-1(2), B4-1(3) and B4-2 to ensure that there are no adverse impacts to sheet flow dependant significant vegetation communities, no adverse impacts to existing surface water flow regimes within Weelamurra, Barnett and Caves Creek (or associated significant drainage lines), no adverse impacts to permanent or semi-permanent pools present within Weelamurra Creek and require a management plan/s that demonstrates how achievement of these outcomes will be monitored and substantiated. These conditions will ensure consistency with the EPA objective for inland waters.

Potential impact to the quality of groundwater and/or surface water

Construction activities in the bed and banks of a watercourse has the potential to cause erosion and sedimentation, which can increase surface water turbidity and decrease surface water quality. This risk is particularly relevant to Weelamurra Creek, Barnett Creek and Caves Creek and their associated significant drainage lines. The proponent proposes to manage this impact through the installation of silt curtains and stabilising bed and banks during construction (Jacobs 2022a).

There is also a minor risk of contamination within the Millstream-Chichester Water Reserve through spills of hydrocarbon or other hazardous substances. This is noting that only a small portion of the stage 4 alignment occurs within the Priority 1 portion of the Millstream Water Reserve PDWSA. To reduce this risk, the proponent proposes the same management measures used during the construction of stages 2 and 3 of the proposal which occurred within Priority 1 PDWSA areas in the Harding Dam catchment and Millstream-Chichester Water Reserve respectively. The proponent commits to implementing recommendations of the Millstream Water Reserve drinking water source protection plan and relevant DWER Water Quality Protection notes.

The EPA recommends condition B4-1(1) to ensure no adverse impacts to surface water quality within Weelamurra Creek, Barnett Creek, Barnett and Caves Creek (or associated significant drainage lines). The EPA considers that the proponent's commitment to implementing the recommendations of relevant water source protection plans and water quality protection notes will manage potential impacts to groundwater quality noting the relatively minimal risk of hazardous material spills. The above recommended condition and proponent's commitment to groundwater management would ensure consistency with the EPA objective for inland waters. The EPA notes that the proponent will need to obtain a permit to disturb the bed and banks of a watercourse in accordance with the RIWI Act.

Cumulative impact assessment

The cumulative impact of the proposal on inland waters with the completed stages 2 and 3 and surrounding projects, including the Eliwana Rail, Eliwana Iron Ore, and Solomon Iron Ore projects, is not expected to be significant given the long linear infrastructure proposed and the hydrological nature of the area. The EPA notes that the Manuwarra Red Dog Highway project passes through the Harding River Catchment (stage 2), Fortescue River Catchment (stages 2 and 3) and Ashburton River Catchment (proposed stage 4).

The EPA noted that stages 2 and 3 of the approved proposal required the preparation and implementation of a surface drainage management plan. The proponent has achieved compliance with the management plan for stage 2, however, there are some ongoing monitoring (and remediation if necessary) measures in the plan that are still required for stage 3. The EPA has therefore recommended condition B7-1(4) which requires the proponent to implement the post-construction requirements of this plan.

2.3.9 Summary of key factor assessment and recommended regulation

The EPA has considered the likely residual impacts of the proposal on inland waters. In doing so, the EPA has considered whether reasonable conditions could be imposed, or other decision-making processes can ensure consistency with the EPA factor objective. The EPA assessment findings are presented in Table 9.

The EPA has also considered the principles of the EP Act (see Appendix C) in assessing whether the residual impacts will be consistent with its environmental factor objective and whether reasonable conditions can be imposed (see Appendix A).

Table 9: Summary of assessment for inland waters

Residual impact or risk to environmental value	Assessment finding	Recommended conditions and DMA regulation
Proposal Groundwater drawdown from abstraction and dewatering during construction. Combined effect with stages 2 and 3 Not likely to be significant given the works for stages 2 and 3 have been completed and will not require ongoing groundwater abstraction.	The EPA has assessed that impacts to groundwater levels are likely to be temporary during construction only and considers that groundwater drawdown is unlikely to be a significant residual impact, subject to recommended conditions requiring no adverse impacts to GDVs and permanent or semi-permanent pools within Weelamurra Creek, and regulation under the RIWI Act. Subject to these conditions, the environmental outcome is likely to be consistent with the EPA objective for inland waters.	**Condition B2 (Flora and Vegetation)** No adverse impact to conservation, or locally significant vegetation communities (including GDVs) and requirement for an environmental management plan that demonstrates how achievement of this outcome will be monitored and substantiated. **Condition B4 (Inland waters)** No adverse impact to permanent or semi-permanent pools within Weelamurra Creek and requirement for an environmental management plan that demonstrates how achievement of this outcome will be monitored and substantiated. **DMA legislation** The DWER can regulate groundwater abstraction and dewatering through RIWI Act water licenses.

Residual impact or risk to environmental value	Assessment finding	Recommended conditions and DMA regulation
Proposal Changes to surface water flows. Combined effect with stages 2 and 3 Not expected to be significant given the long linear infrastructure and hydrological nature of the area, noting that the project passes through the Harding River Catchment (Stage 2), Fortescue River Catchment (Stages 2 and 3) and Ashburton River Catchment (Stage 4).	The EPA has considered that the presence of the existing Rio Tinto rail infrastructure has influenced surface water hydrology in the area since the 1970's. The proponent has aligned the proposal to run parallel to the rail infrastructure. The proposal is not expected to impede surface water flows to a greater extent than the existing infrastructure. The EPA considers that changes to existing surface water flows has the potential to indirectly impact on vegetation communities and surface water flows within major watercourses and associated drainage lines. The EPA advises that changes to surface water flows is unlikely to be a significant residual impact, subject to recommended conditions requiring no adverse impacts to significant vegetation communities, or surface water flows to Weelamurra Creek, Barnett Creek, Caves Creek and associated major drainage lines. Subject to these conditions, the environmental outcome is likely to be consistent with the EPA objective for inland waters.	**Condition B2 (Flora and Vegetation)** No adverse impact to significant vegetation communities and requirement for an environmental management plan that demonstrates how achievement of this outcome will be monitored and substantiated. **Condition B4 (Inland waters)** No adverse impact to surface water flow regimes within Weelamurra Creek, Caves Creek, Barnett Creek or associated major drainage lines and requirement for an environmental management plan that demonstrates how achievement of this outcome will be monitored and substantiated.
Proposal Potential impact to surface and groundwater quality. Combined effect with stages 2 and 3 Not expected to be significant given the long linear infrastructure and hydrological nature of the area, noting that the project passes through the Harding River Catchment (Stage 2),	The EPA has assessed that potential impact to groundwater quality is not likely to be significant given the proponents commitment to implement recommendations of the Millstream Water Reserve drinking water source protection plan and relevant DWER Water Quality Protection notes. The EPA has assessed that potential impact to surface water quality is unlikely to be	**Condition B4 (Inland waters)** No adverse impact to surface water quality within Weelamurra Creek, Barnett Creek and Caves Creek, or associated major drainage lines and requirement for an environmental management plan that

Residual impact or risk to environmental value	Assessment finding	Recommended conditions and DMA regulation
Fortescue River Catchment (Stages 2 and 3) and Ashburton River Catchment (Stage 4).	significant subject to recommended conditions requiring no adverse impacts to surface water quality within Weelamurra Creek, Barnett Creek, Caves Creek and associated major drainage lines. Subject to these conditions, the environmental outcome is likely to be consistent with the EPA objective for inland waters.	demonstrates how achievement of this outcome will be monitored and substantiated.

2.4 Social surroundings

2.4.1 Environmental objective

The EPA environmental objective for social surroundings is *to protect social surroundings from significant harm* (EPA 2021b).

2.4.2 Investigations and surveys

The EPA advises the following investigations were used to inform the assessment of the potential impacts to social surroundings:

- Final report of an ethnographic survey Karratha to Tom Price Road alignment in Eastern Guruma Country 3 August – 8 August (Yulur Heritage 2020a)
- Preliminary advice of a site avoidance archaeological heritage survey for the Karratha Tom Price Road Stage 4 Alignment Tom Price Railway Rd SLK0-51, Eastern Guruma Country (Yulur Heritage 2020b)
- Report on a site avoidance archaeological heritage survey of the Karratha Tom Price Road Stage 4 Alignment Tom Price Railway Rd SLK0-51 undertaken in Eastern Guruma Country by the Wintawari Guruma representatives and Yulur Heritage (Yulur Heritage 2020c)
- Preliminary advice of the trip 2 site avoidance archaeological heritage survey for the Manuwarra Red Dog Highway Karratha Tom Price Road Stage 4 Alignment Tom Price Railway Road SLK0-50, Eastern Guruma Country (Yulur Heritage 2021a)
- Report on the trip 2 site avoidance archaeological heritage survey of the Manuwarra Red Dog Highway Karratha Tom Price Road Stage 4 Alignment Tom Price Railway Rd SLK0-50 undertaken in Eastern Guruma Country by the Wintawari Guruma representatives and Yulur Heritage (Yulur Heritage 2021b)
- Preliminary advice of an Aboriginal archaeological survey of works associated with the Karratha to Tom Price Road Stage 4 Alignment Corridor (Roebourne

Wittenoom Rd SLK58-74 & Tom Price Railway Rd SLK51-106), Pilbara, Western Australia Trip 1 (Gavin Jackson 2020a)

- Report of an Aboriginal archaeological Site Avoidance survey of works associated with the Karratha to Tom Price Road Stage 4 Alignment Corridor (Roebourne Wittenoom Rd SLK58-74 & Tom Price Railway Rd SLK51-106), Pilbara, Western Australia Trip 1 (Gavin Jackson 2020b)
- Preliminary advice of an Aboriginal archaeological survey of works associated with the Karratha to Tom Price Road Stage 4 Alignment Corridor (Roebourne Wittenoom Rd SLK68-74 & Tom Price Railway Rd SLK51-108), Pilbara, Western Australia Trip 2 (Gavin Jackson 2020c)
- Report of an Aboriginal archaeological Site Avoidance survey of works associated with the Karratha to Tom Price Road Stage 4 Alignment Corridor (Roebourne Wittenoom Rd SLK58-74 & Tom Price Railway Rd SLK51-106), Pilbara, Western Australia Trip 2 (Gavin Jackson 2020d)
- Preliminary advice of an Aboriginal archaeological Site Avoidance survey of works associated with the Karratha to Tom Price Road Stage 4 Alignment Corridor (Roebourne Wittenoom Rd SLK68-74 & Tom Price Railway Rd SLK51-108), Pilbara, Western Australia (Gavin Jackson 2020e)
- Report of an Aboriginal archaeological Site Avoidance survey of works associated with the Karratha to Tom Price Road Stage 4 Alignment Corridor (Roebourne Wittenoom Rd SLK58-74 & Tom Price Railway Rd SLK51-106), Pilbara, Western Australia Trip 3 (Gavin Jackson 2021a)
- Preliminary advice of an Aboriginal archaeological Site Avoidance survey of works associated with the Karratha to Tom Price Road Stage 4 Alignment Corridor (Roebourne Wittenoom Rd SLK68-74 & Tom Price Railway Rd SLK51-108), Pilbara, Western Australia Trip 4 (Gavin Jackson 2021b)
- Report of an Aboriginal archaeological Site Avoidance survey of works associated with the Karratha to Tom Price Road Stage 4 Alignment Corridor (Roebourne Wittenoom Rd SLK58-74 & Tom Price Railway Rd SLK51-106), Pilbara, Western Australia Trip 4 (Gavin Jackson 2021c)
- Preliminary advice of an Aboriginal archaeological Site Avoidance survey of works associated with the Karratha to Tom Price Road Stage 4 Alignment Corridor (Manuwarra Red Dog Highway SLK134.97–135.87 & Tom Price Railway Rd SLK51-108), Pilbara, Western Australia Trip 5 (Gavin Jackson 2021d)
- Report of an Aboriginal archaeological Site Avoidance survey of works associated with the Karratha to Tom Price Road Stage 4 Alignment Corridor (Roebourne Wittenoom Rd SLK58-74 & Tom Price Railway Rd SLK51-106), Pilbara, Western Australia Trip 5 (Gavin Jackson 2021e)
- Preliminary Advice following an Yindjibarndi Ethnographic Site Identification Heritage Survey of the Karratha Tom Price Road Stage 4 Alignment Corridor; Roebourne Wittenoom Rd SLK58-74 and Tom Price Railway Rd SLK51-106 in the West Pilbara. Trip 1, June-July 2020 (Robin Stevens 2020a)
- Report of a Yindjibarndi Ethnographic Site Identification Heritage Survey of the Karratha Tom Price Road Stage 4 Alignment Corridor; Roebourne Wittenoom Rd

SLK58-74 and Tom Price Railway Rd SLK51-106 in the West Pilbara. Trip 1, June-July 2020 (Robin Stevens 2020b).

The EPA notes that the final archaeological and ethnographic heritage survey of the development envelope within Wintawari Guruma country took place in November 2022. The EPA notes that the proponent intends to undertake further consultation with representatives of the Wintawari Guruma People to determine mitigation measures to manage any impact to any newly identified sites.

The EPA determined it could proceed with its assessment despite the provision of the final report, because of recommended conditions B5-3 and B5-4, which require the proponent to prepare and implement Aboriginal Heritage management plans with the relevant Traditional Owners. As part of this, the proponent will be required to undertake ongoing consultation with the relevant Traditional Owners about achievement of outcomes and objectives for Aboriginal cultural heritage and inland waters (in the context of Aboriginal cultural heritage).

2.4.3 Assessment context: existing environment

Approved Proposal (Ministerial Statement 677)

The assessment of the approved proposal preceded native title determination over the approved proposal area. Aboriginal heritage was identified as a relevant factor for the approved proposal however, the potential impacts were not detailed in the assessment.

Stages 2 and 3 occurred within Yindjibarndi country. Ministerial Statement 677 required preparation and implementation of an AHMP. The AHMP (latest version 2018) noted that 17 Aboriginal Sites or places of significance were identified within the development envelope of stages 2 and 3. The Yindjibarndi representatives provided consent for the proponent to undertake the proposed development of stages 2 and 3. The current approved AHMP also covers most of the proposed stage 4 development envelope that occurs on Yindjibarndi country.

The impacts to social surroundings for this proposal (significant amendment) are referred to below.

Aboriginal heritage

The northern section of the stage 4 development envelope occurs within the Yindjibarndi section of the combined Ngarluma/Yindjibarndi (WCD2005/001) native title determination area and the Yindjibarndi #1 (WCD2017/010) native title determination area of the Yindjibarndi People. The southern extent of the stage 4 development envelope is within the Eastern Guruma (WCD2007/001) native title determination area of the Wintawari Guruma People.

Five registered and 3 lodged Aboriginal heritage sites occur within the development envelope:

- Horseshoe Bore 02 (Site ID 17332) – registered

- Mt Margaret 96-1 (Hamersley Plateau) (Site ID 17335) – registered
- Weelamurra Creek Ceremonial Ground (Site ID 18173) – registered
- Narraminju (Caves Creek) (Site ID 37670) – registered
- Weelamurra Wuntu (Willamarranha, Wilumarra and Wirlumarra) (Site ID 38183) – registered
- RTCO3-E1 (Site ID 21075) – lodged
- Jurkanunha Marnta (Site ID 37886) – lodged
- KTP/FS3 (Site ID 19906) – lodged.

Based on the indicative disturbance footprint and possible refinements to the alignment, Narraminju (Caves Creek) (Site ID 37670) and Jurkanunha Marnta (Site ID 37886) are completely avoided, and the other registered or lodged sites are partially intersected by the indicative disturbance footprint (Jacobs 2022c).

The archaeological and ethnographic surveys over the development envelope identified 31 new sites within Eastern Guruma country and 20 new sites within Yinjibarndi country that are likely to constitute Aboriginal heritage sites under the *Aboriginal Cultural Heritage Act 2021* (ACH Act) (Jacobs 2022b).

The Yindjibarndi People and Wintawari Guruma People highlighted the cultural significance of watercourses within the area and emphasised the importance of ensuring the proposal does not decrease the water quality or impede surface water flows of Manggurdu (Fortescue River), Weelamurra Wuntu (Weelamurra Creek), Narraminju Wuntu (Caves Creek), Wartarnha Wuntu (Barnett Creek) and their associated tributaries. Impacts to these watercourses has been assessed under section 2.3, inland waters, including reference to recommended conditions to manage impacts to these watercourses.

2.4.4 Consultation

No comments were received during the public review period.

2.4.5 Potential impacts from the proposal

The proposal has the potential to significantly impact on social surroundings from:

- direct impacts to Aboriginal heritage sites from clearing and ground disturbance
- indirect impact to Aboriginal heritage sites and areas of cultural importance from changes to surface water flows and water quality
- constraints or changes to land access to cultural heritage sites, or areas of country used for customary uses by Traditional Owners.

The proponent will be required to obtain approvals under the ACH Act if direct impact to Aboriginal cultural heritage is unavoidable.

2.4.6 Avoidance measures

The proponent has committed to avoid impacting the Heritage restriction zone identified as HRZ_01 around the extent of a distinctive rock formation. The proponent has also changed the alignment to avoid Hamersley Homestead (as requested by the Wintawari Guruma People), where a 1.2 km amenity buffer will be maintained to the Hamersley Homestead. The proponent notes that it will endeavour to avoid newly identified and previously known Aboriginal heritage sites and significant places where practical and possible.

2.4.7 Minimisation measures (including regulation by other DMAs)

The proponent outlined the following minimisation measures to reduce both direct and indirect impacts to social surroundings (Jacobs 2022a; Jacobs 2022c):

- undertake detailed design and construction planning to prioritise avoidance of direct impact to identified Aboriginal heritage sites
- ongoing consultation with relevant Traditional Owners to understand significance of the area, specific sites, and identify areas to avoid
- temporary clearing for construction activities will not occur within registered Aboriginal heritage sites
- all personnel and contractors to complete cultural awareness training with local Traditional Owners
- engage Aboriginal cultural heritage monitors to observe ground disturbance to prevent or mitigate harm to Aboriginal cultural heritage
- provide opportunity to salvage heritage sites that will be impacted
- implement unexpected finds (stop-works) protocol to manage discovery of new heritage values during ground-disturbing activities.

The proposed mitigation measures to minimise impact to inland waters is assessed in section 2.3.

2.4.8 Revegetation measures

All temporary cleared areas for construction, such as laydowns, stockpiling areas and areas cleared for ancillary infrastructure will be revegetated.

2.4.9 Assessment of impacts to environmental values

The EPA considered that Aboriginal cultural heritage is the key social surroundings value likely to be impacted by the proposal.

Aboriginal heritage

The EPA has considered the likely residual impacts of the proposal on social surroundings to be potential direct and indirect impacts to cultural heritage, and loss of access or restriction of access to country.

During the surveys, both the Yindjibarndi People and the Eastern Guruma People emphasised the vital importance and special significance of waterways and requested that surface water flows are not impeded, and water quality is not compromised during construction and maintenance of the proposal. The potential impact to inland waters from the proposal is assessed in section 2.3.

Eastern Guruma country

Based on the indicative disturbance footprint, of the 31 newly identified sites recorded in the development envelope, 10 may be impacted by the proposal, being sites WG Site 2, WG Site 12, WG Site 13, WG Site 16, WG Site 21, WG Site 22, WG Site 23, WG Site 24, WG Site 29 and WG Site 31. One heritage restriction zone, HRZ_01, around a distinctive rock formation will be avoided to conserve its integrity (Jacobs 2022b).

The Wintawari Guruma People recommended that where possible, all other newly identified heritage places should be avoided and protected from damage, in particular heritage places BJD08_45, HRZ_01, MR_EAS_21_001, MR_EAS_21_002, MR_EAS_21_003, MR_EAS_21_004, MR_EAS_21_005, MR_EAS_21_006, MR_EAS_21_007, MR_EAS_21_008, MR_EAS_21_009, MR_EAS_21_010, MR_EAS_21_011, MR_EAS_21_012, and S11-181.

The Wintawari Guruma People also recommended that Weelamurra Creek Ceremonial Ground, Weelamurra Ceremonial Heritage Restriction Zone (HRZ), Hawk Pool Restriction Zone, and Four Mile Heritage Restriction Zone (Nhuwarnmunha) (preliminary) be protected. The EPA has considered that an expansive preliminary HRZ (around 350 ha) has been established for the Four Mile site. This significant cultural area is expected to extend further southwards, pending further consideration by the Wintawari Guruma People. While topographical constraints limit the proponent's ability to re-align the road to completely avoid the expansive Four Mile preliminary HRZ, the proponent has avoided the Four Mile Bore and Birthing Place significant sites. The proponent has advised that it has recently been in contact with the Eastern Guruma Traditional Owners regarding the Four Mile HRZ, who have indicated that they will assist the proponent to finalise a suitable alignment that avoids the significant values of this site.

The proponent has advised that further road design work and liaison with representatives of the Wintawari Guruma People is being undertaken to determine the extent of impact to other identified heritage places, and to determine whether they can be completely avoided (Jacobs 2022c).

Furthermore, the Wintawari Guruma People highlighted through the surveys the importance of continued access to Mount Brockman Road, as it is the only east-west

access point along the Hamersley Ranges to very important sites that are still frequently used. The highway is proposed to cross Mount Brockman Road.

The EPA has recommended conditions B5-1, B5-2 and B5-4, requiring the proponent to avoid direct disturbance of HRZ_01, ensure continued access to Mount Brockman Road, avoid where practicable or otherwise minimise disturbance to significant sites, consult and engage with Traditional Owners regarding minimising impacts to Four Mile HRZ, and develop a AHMP in consultation with representatives of the Wintawari Guruma People. The EPA considers that subject to these conditions, the proposal can be managed to ensure that places of cultural significance are not significantly impacted. These conditions would ensure the proposal is consistent with the EPA objective for social surroundings.

Yindjibarndi country

The Yindjibarndi People have recommended that all Aboriginal heritage sites remain in situ and be avoided, including the following newly identified sites, *MR_YIN_20_001, MR_YIN_20_002, MR_YIN_20_003, MR_YIN_20_004, MR_YIN_20_005, MR_YIN_20_006, MR_YIN_20_007, MR_YIN_20_008, MR_YIN_20_009, MR_YIN_20_010, MR_YIN_20_011, MR_YIN_20_012, MR_YIN_20_013 and MR_YIN_20_014, MR_YIN_20_015, MR_YIN_21_001, MR_YIN_21_002, MR_YIN_21_003, MR_YIN_21_004,* and *RTF04-01*.

Based on the indicative disturbance footprint, none of the newly identified sites are directly impacted by the proposal (Jacobs 2022c). The proponent advises that should any heritage sites require disturbance, this will be agreed upon by representatives of the Yindjibarndi People, and any sites to be disturbed will be recorded to a Site Identification standard in collaboration with Yindjibarndi People (Jacobs 2022c).

The Yindjibarndi People also recommend avoidance of western pebble-mound mouse mounds, impacts to Weelamurra creek, impacts to the natural flow of water through east-west running creek and tributaries, and large trees. The EPA has recommended conditions to require no adverse impacts to the surface water quality or flow regimes within Weelamurra Creek (see section 2.3 inland waters). The EPA has considered the proponents commitment to creating a 50 m no-go zone between construction activities and known active mounds for the western pebble-mound mouse that are located outside of the final disturbance footprint (Jacobs 2022a). The proponent has also committed to undertaking displacement methods should active western pebble mouse mounds be required for disturbance, in line with methods previously endorsed by DBCA (Jacobs 2022a).

The EPA notes that as part of the approved proposal an AHMP was required to be developed and approved by the CEO. The current approved AHMP covered all of stage 3 and covers most of stage 4 of the proposal that occurs on Yindjibarndi country. The EPA recommends conditions B5-2 and B5-3 requiring the proponent to avoid, where practicable, and otherwise minimise disturbance to significant sites within Yindjibarndi country and prepare an updated AHMP in consultation with representatives of the Yindjibarndi People prior to ground disturbing activities. The EPA also recommends condition B5-1(2) to ensure no interruption of ongoing access

to land used for traditional use or custom. These conditions would ensure the proposal is consistent with the EPA objective for social surroundings.

Cumulative impact assessment

The impacts to Aboriginal heritage sites from stages 2 and 3 were not detailed in the approved proposal assessment. Ministerial Statement 677 required preparation and implementation of an AHMP. The AHMP (2018) noted that 17 Aboriginal Sites or places of significance were identified within stages 2 and 3.

Yindjibarndi representatives provided consent for the proponent to undertake the proposed development of stages 2 and 3. Noting that the approved proposal required the preparation and implementation of an AHMP to protect and preserve cultural heritage within the area influenced by roadworks, and that the EPA recommends an AHMP for the current proposal, it is considered that cumulative impacts will be appropriately managed through these plans and appropriate consultation with Traditional Owners.

The EPA also notes that the related nearby projects, Eliwana Rail and Eliwana Iron Ore Mine, required social, cultural and heritage management plans to minimise impacts to Aboriginal heritage values. The nearby Solomon Iron Ore Mine Project EPA assessment did not identify Aboriginal heritage to be a key factor.

2.4.10 Summary of key factor assessment and recommended regulation

The EPA has considered the likely residual impacts of the proposal on social surroundings. In doing so, the EPA has considered whether reasonable conditions could be imposed, or other decision-making processes can ensure consistency with the EPA factor objective. The EPA assessment findings are presented in Table 10.

The EPA has also considered the principles of the EP Act (see Appendix C) in assessing whether the residual impacts will be consistent with its environmental factor objective and whether reasonable conditions can be imposed (Appendix A).

Table 10: Summary of assessment for social surroundings

Residual impact	Assessment finding	Recommended conditions and DMA regulation
Proposal Potential for direct and/or indirect impact to Aboriginal heritage sites and areas of cultural significance. Combined effect with stages 2 and 3 17 Aboriginal sites of significance were identified within the development	The EPA has concluded that there is a risk of adverse impacts to Aboriginal cultural heritage. The EPA advises that any potential residual impact to Aboriginal cultural heritage is likely to be managed through recommended	**Condition B5 (Aboriginal cultural heritage)** Requirement for AHMPs to be developed in consultation with relevant Traditional Owner groups, prior to ground disturbing activities. **Condition B5 (Aboriginal cultural heritage)**

Residual impact	Assessment finding	Recommended conditions and DMA regulation
envelope of stages 2 and 3 within Yindjibarndi country. The Yindjibarndi representatives provided consent for the proponent to undertake the proposed development of stages 2 and 3. Noting that an AHMP was implemented for these stages and is recommended as a requirement for the proposed stage 4 (including a new AHMP for Eastern Guruma Country and update to the AHMP within Yindjibarndi country), the combined effects to Aboriginal heritage are unlikely to be significant.	conditions requiring preparation and/or development of AHMPs, consultation with Traditional Owners, no disruption to access, and avoid/minimise impacts to significant sites. Subject to these conditions the environmental outcome is likely to be consistent with the EPA objective for social surroundings.	Avoidance of Heritage Restriction Zone HRZ_01. **Condition B5 (Aboriginal cultural heritage)** No interruption of ongoing access to land utilised for traditional use or custom. **Condition B5 (Aboriginal cultural heritage)** Avoidance where possible, otherwise minimise direct disturbance to significant sites. **Condition B5 (Aboriginal cultural heritage)** Ongoing consultation and engagement with traditional owners, including around minimising impacts to the Four Mile preliminary HRZ.

3 Holistic assessment

While the EPA assessed the impacts of the proposal against the key environmental factors and environmental values individually in the key factor assessments above, given the link between flora and vegetation, terrestrial fauna, inland waters and social surroundings, the EPA also considered connections and interactions between them to inform a holistic view of impacts to the whole environment.

Figure 5 illustrates the connections and interactions between the key environmental factors, to inform the EPA's holistic assessment.

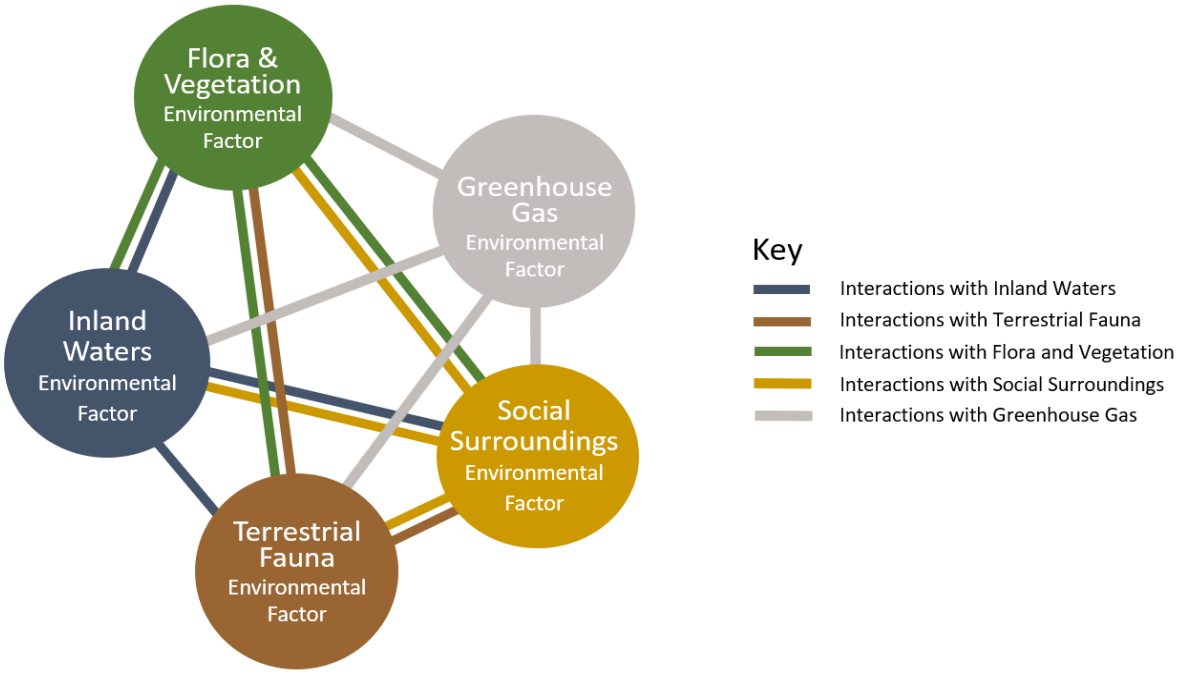

Figure 5: Intrinsic interactions between environmental factors

Flora and vegetation – Terrestrial fauna – Inland waters

There is a high degree of connectivity between the environmental factors of flora and vegetation, terrestrial fauna, and inland waters. The flora and vegetation provide habitat for threatened fauna, including northern quoll, ghost bat, Pilbara leaf-nosed bat and Pilbara olive python. Surface water flows ensure the health of vegetation growing in association with watercourses, and this riparian vegetation including GDVs, provide long, uninterrupted vegetation cover along drainage lines that provide connectivity for fauna across the landscape. The health of grove-intergrove mulga communities, that provide refugia for terrestrial fauna, the Themeda grasslands TEC and Brockman Iron PEC are dependent on unimpeded landscape sheet flow.

The EPA considers that the proposed mitigation and management measures, and recommended conditions, including outcome based conditions and environmental management plans for impacts and offsetting of significant residual impacts will

mean the inter-related impacts to these environmental factors, will be consistent with the EPA environmental factor objectives.

Social surroundings

There is a direct link between Aboriginal culture and the physical or biological aspects of the environment. Access to land, ability to carry out traditional Aboriginal customs and areas of cultural importance may be impacted through impacts to environmental factors of flora and vegetation, terrestrial fauna and inland waters.

The EPA considers that the proposed mitigation and management measures and recommended conditions for impacts to flora and vegetation, terrestrial fauna and inland waters will also mean the interrelated impacts to the values of social surroundings will likely be consistent with the EPA environmental factor objectives.

Cumulative impact of multiple infrastructure proposals

This proposal will result in further fragmentation of fauna habitats and conservation significant ecological communities within the Pilbara, and these cumulative impacts should be avoided, and assessed when avoidance is not possible.

There are currently a number of other approved infrastructure proposals within the local area. These include Eliwana Rail Project (Ministerial statement 1108), Eliwana Iron Ore Project (Ministerial Statement 1109) and Solomon Iron Ore Project (Ministerial Statement 1062).

The EPA has assessed the cumulative effects by considering the impacts of the proposal, the completed stages 2 and 3 Manuwarra Red Dog Highway, and the above approved projects, while also acknowledging the presence of the Rio Tinto rail infrastructure which occurs within close proximity on the western side of the proposal for the majority of the alignment.

The EPA considers that on a bioregional scale, implementation of this proposal would contribute to cumulative impacts through fauna habitat loss and fragmentation, and conservation significant community loss and fragmentation. However, the impacts are not to a level that would alter the likely environmental outcomes of this proposal.

The EPA has considered that the significant amendment includes a direct disturbance footprint of more than double the area that was initially applied for, noting that Ministerial Statement 677 originally approved 574 ha and now an additional 657 ha (including 646 ha in a ‘Good’ or better condition) is being sought. The EPA recommends condition B1 to mitigate the potential for additional disturbance in the future, by requiring final disturbance footprint plans which are consistent with the approved footprint amount, prior to construction.

The EPA expects that completion of the highway will avoid unnecessary future infrastructure which would further fragment native vegetation.

Summary of holistic assessment

When the separate environmental factors and values affected by the proposal were considered together in a holistic assessment, the EPA formed the view that the impacts from the proposal would not alter the EPA's views about consistency with the EPA's factor objectives as assessed in section 2.

4 Offsets

Environmental offsets are actions that provide environmental benefits which counterbalance the significant residual impacts of a proposal.

Consistent with the *WA Environmental Offsets Guidelines* (Government of Western Australia 2014), the EPA may consider the application of environmental offsets to a proposal where it determines that the residual impacts of a proposal are significant, after avoidance, minimisation and rehabilitation have been pursued.

The EPA considers that the clearing of native vegetation and impacts on other associated environmental values in the Pilbara IBRA bioregion is significant where the cumulative impact may reach critical levels if not managed (EPA 2014). The Pilbara's unique land tenure hampers the delivery of offsets, and the Pilbara Environmental Offsets Fund (PEOF) has been established to provide a strategic landscape-scale approach that builds on regional programs to deliver environmental offset outcomes greater than can be achieved by individual proposals.

Projects currently being delivered through the PEOF include weed management of Woodstock Abydos Aboriginal Reserve, coordinated fire management programs in the Fortescue River area, and an eradication program of *Parkinsonia aculeata* along the Shaw River. Together, these programs are aiming to control threatening processes to improve vegetation condition and habitat for fauna, including threatened fauna. DBCA is also reviewing and developing management and research priorities for northern quoll, greater bilby, ghost bat, Pilbara leaf-nosed bat and Pilbara olive python to guide future investment in fauna programs (Government of Western Australia 2022).

The proposal is located within the Chichester, Fortescue and Hamersley subregions of the Pilbara IBRA bioregion. The special purpose account statement for the PEOF states that monetary contributions can be accepted in the fund for proposals located wholly or partly within the Pilbara IBRA region.

In the case of this proposal, likely (and potential) significant impacts are to:

- flora and vegetation values
- significant fauna habitat values.

In applying the residual impact significance model (Government of Western Australia 2014), the EPA considers the proposal would result in significant residual impacts to:

- 'Good' to 'Excellent' condition native vegetation, which includes locally significant vegetation
- *Themeda* grasslands on cracking clays (Hamersley Station, Pilbara) TEC
- Brockman Iron cracking clay communities of the Hamersley Range PEC
- critical and supporting habitat for northern quoll
- critical and supporting habitat for ghost bat

- supporting habitat for Pilbara leaf-nosed bat and Pilbara olive python.

The EPA has concluded that the clearing of habitat is a significant residual impact on its own, in the context of the proposal, and in the context of the biological diversity and ecological integrity in the local area, as it provides habitat for threatened fauna species.

Due to the remaining quantity and quality of habitat types in the local area and region, the EPA considers that the significant residual impact could be counterbalanced in accordance with the WA Environmental Offsets Guidelines by a contribution to the PEOF. The EPA considers PEOF future projects are expected to be able to counterbalance the significant impacts from the clearing of native vegetation (including conservation significant ecological communities) and critical fauna habitat of the proposal. The EPA notes that PEOF Governance Framework (August 2019) states that projects will aim to counterbalance the significant residual impacts that have been identified in Ministerial Statements with projects that are designed to deliver enduring and long-term strategic conservation outcomes in the Pilbara. PEOF Implementation Plans identify the significant residual impacts for which contributions to the Fund have been made and how they will be addressed.

The EPA recommends condition B6 be imposed on the proponent to provide an offset in the form of a contribution to the PEOF, to counterbalance the significant residual impacts of the proposal.

The EPA recommends that the following offset rates (calculated on the 2021-2022 calendar year) should apply in the form of a contribution to the PEOF for landscape-scale actions to protect biodiversity in the Pilbara:

- $841 AUD (excluding GST) per hectare of ‘Good’ to ‘Excellent’ condition native vegetation and supporting habitat for northern quoll, ghost bat, Pilbara leaf-nosed bat and Pilbara olive python cleared as a result of the proposal within the Chichester IBRA subregion
- $890 AUD (excluding GST) per hectare of ‘Good’ to ‘Excellent’ condition native vegetation and supporting habitat for northern quoll, ghost bat, Pilbara leaf-nosed bat and Pilbara olive python cleared as a result of the proposal within the Hamersley IBRA subregion
- $1780 AUD (excluding GST) per hectare of ‘Good’ to ‘Excellent’ condition native vegetation and supporting habitat for northern quoll, ghost bat, Pilbara leaf-nosed bat and Pilbara olive python cleared as a result of the proposal within the Fortescue IBRA subregion
- $1780 AUD (excluding GST) per hectare of the *Themeda* grasslands on cracking clays TEC, cleared as a result of the proposal (restricted to the Hamersley IBRA subregion)
- $1780 AUD (excluding GST) per hectare of the Brockman Iron cracking clays communities of the Hamersley Ranges PEC, cleared as a result of the proposal (restricted to the Hamersley IBRA subregion)

- $1780 AUD (excluding GST) per hectare of critical habitat for northern quoll and ghost bat cleared as a result of the proposal (restricted to the Hamersley IBRA subregion).

For future proposals that impact on Themeda Grasslands TEC, the EPA considers that it will be increasingly difficult to offset through PEOF. This is noting that most of the mapped occurrence of the TEC is on Hamersley Station (pastoral lease), which currently restricts the potential to secure known patches of the TEC under conservation tenure. The EPA considers it appropriate in this instance to counterbalance significant residual impacts to the TEC through PEOF, given the relatively small area of impact and the conservation benefit in funding weed control, grazing management and feral animal management within the TEC. However, future proposals impacting the TEC may need to identify other types of offsets that lead to the long-term conservation of TEC occurrences.

5 Recommendations

The EPA has taken the following into account in its assessment of the proposal:

- environmental values which may be significantly affected by the proposal
- assessment of key environmental factors, separately and holistically (this has included considering cumulative impacts of the proposal where relevant)
- likely environmental outcomes which can be achieved with the imposition of conditions
- consistency of environmental outcomes with the EPA's objectives for the key environmental factors
- EPA's confidence in the proponent's proposed mitigation measures
- whether other statutory decision-making processes can mitigate the potential impacts of the proposal on the environment
- principles of the EP Act.

The EPA recommends that the proposal may be implemented subject to the conditions recommended in Appendix A.

Appendix A: Recommended conditions

Section 44(2)(b) of EP Act specifies that the EPA's report must set out (if it recommends that implementation be allowed) the conditions and procedures, if any, to which implementation should be subject. This appendix contains the EPA's recommended conditions and procedures.

Recommended Environmental Conditions

STATEMENT THAT A SIGNIFICANT AMENDMENT TO AN APPROVED PROPOSAL MAY BE IMPLEMENTED

***(Environmental Protection Act 1986*)**

MANUWARRA RED DOG HIGHWAY PROJECT (SIGNIFICANT AMENDMENT)

Proposal:	The proposal is to amend the existing Manuwarra Red Dog Highway Project, formerly known as the New Road from Tom Price to Karratha Project, to construct and operate a dual carriageway approximately 251 km in length between Tom Price and Karratha.
Proponent:	Commissioner of Main Roads Western Australia Australian Business Number 50 860 676 021
Proponent address:	Don Aitken Centre, Waterloo Crescent EAST PERTH WA 6004
Assessment number:	2273

Report of the Environmental Protection Authority: 1736

Previous Assessment Number: 1244

Previous Report of the Environmental Protection Authority: 1159

Previous Statement Number: 677

Introduction: The proposal is a significant amendment to the existing 'Road from Karratha to Tom Price Shires of Ashburton & Roebourne' approved proposal which was agreed to be implemented under Ministerial Statement 677.

Pursuant to section 45 of the *Environmental Protection Act 1986*, it is now agreed that:

1. the significant amendment to the approved proposal described and documented in the proponent's 'Proposal Content Document (Revision 4, January 2023), may be implemented;

2. Ministerial Statement 677 for the existing ‘Road from Karratha to Tom Price Shires of Ashburton & Roebourne’ approved proposal is superseded under section 40AA(6)(b) of the *Environmental Protection Act 1986*; and

3. the implementation of the significantly amended proposal (being the existing approved proposal as amended by the significant amendment proposal) is subject to the following implementation conditions and procedures.

Conditions and procedures:

Part A: Proposal extent

Part B: Environmental outcomes, prescriptions and objectives

Part C: Environmental management plans and monitoring

Part D: Compliance and other conditions

PART A: PROPOSAL EXTENT

A1 Limitations and Extent of Proposal

A1-1 The proponent must ensure that the proposal is implemented in such a manner that the following maximum extents are not exceeded:

Proposal element	Location	Maximum extent
Physical elements		
Stage 4 development envelope subject to this significant amendment, including • road infrastructure; • drainage structures; • waterway crossings; • borrow pits; • haul road fencing; • temporary construction camps; • administrative buildings; and • other ancillary infrastructure associated with the construction of the proposal.	Figure 1	Clearing of no more than 646 **ha** of native vegetation in a **'Good'** or better condition, including 100 **ha** of temporary clearing, within a 7,142 **ha** development envelope.

PART B – ENVIRONMENTAL OUTCOMES, PRESCRIPTIONS AND OBJECTIVES

B1 Disturbance Footprint Report

B1-1 The proponent shall prepare and submit a Disturbance Footprint Report to the CEO that identifies the final disturbance footprint for **stage 4** of the proposal prior to construction. The Disturbance Footprint Report may be submitted in stages and must demonstrate, at every stage, that the maximum clearing extents specified under conditions A1-1, B2-1(3) and B3-1(1) will be met for all stages combined.

B2 Flora and Vegetation

B2-1 The proponent must ensure that the implementation of **stage 4** of the proposal achieves the following environmental outcomes:

(1) no **disturbance** of *Hibiscus* sp. Mt Brockman (E. Thoma ET 1354), *Josephinia* sp. Woodstock (A.A. Mitchell PRP 989), *Aristida lazaridis, Euphorbia inappendiculata* var. *inappendiculata,* and *Euphorbia inappendiculata* var. *queenslandica* as recorded in the **baseline biological survey**;

(2) no **disturbance** of areas not reasonably expected to be required for ongoing operations of the following environmental values, as recorded in the **baseline biological survey**:

(a) 'Themeda grasslands on cracking clays (Hamersley Station, Pilbara)' threatened ecological community, represented by vegetation types C4, C5 and P6;

(b) 'Brockman Iron cracking clay communities of the Hamersley Range' priority ecological community, represented by vegetation type C3;

(c) potential groundwater dependant vegetation, represented by vegetation types D1, D2 and D3; and

(d) priority flora.

(3) **disturb** no more than the following environmental values, as recorded in the **baseline biological survey**:

(a) 15 **ha** of the 'Themeda grasslands on cracking clays (Hamersley Station, Pilbara)' threatened ecological community, represented by vegetation types C4, C5 and P6;

(b) 12 **ha** of the 'Brockman Iron cracking clay communities of the Hamersley Range' priority ecological community, represented by vegetation type C3;

(c) 20.1 **ha** of potential groundwater dependant vegetation, represented by vegetation types D1, D2 and D3;

(d) 13.2 **ha** of the vegetation on cracking clays locally significant vegetation community, represented by vegetation type C2;

(e) 80.9 **ha** of the grove-intergrove mulga locally significant vegetation community, represented by vegetation types M1 and M2; and

(f) 0.2 **ha** of the cracking clays community represented by vegetation type P7.

(4) no **adverse impacts**, beyond the extents identified in condition B2-1(3), to the following environmental values as recorded in the **baseline biological survey**:

(a) 'Themeda grasslands on cracking clays (Hamersley Station, Pilbara)' threatened ecological community, represented by vegetation types C4, C5 and P6;

(b) 'Brockman Iron cracking clay communities of the Hamersley Range' priority ecological community, represented by vegetation type C3;

(c) potential groundwater dependant vegetation represented by vegetation types D1, D2 and D3;

(d) vegetation on cracking clays locally significant vegetation community, represented by vegetation type C2;

(e) grove-intergrove mulga locally significant vegetation community, represented by vegetation types M1 and M2; and

(f) cracking clays community represented by vegetation type P7.

B2-2 The proponent must prepare an environmental management plan, that satisfies the requirements of condition C4 and demonstrates how achievement of the flora and vegetation environmental outcomes in condition B2-1(4), will be monitored and substantiated, and submit it to the **CEO**, on advice of the **DBCA.**

B2-3 The proponent must revegetate all areas of native vegetation cleared, but not reasonably expected to be required for ongoing operations within the **stage 4** development envelope, within twenty-four (24) months of completion of **construction activities** until revegetation achieves a **'Good'** quality of vegetation.

B2-4 The proponent shall undertake weed control and management of kapok (*Aerva javanica*) and ruby dock (*Rumex vesicarius*) within Millstream-Chichester National Park within 50 m of the proposal during operation of the road.

B3 Terrestrial fauna

B3-1 The proponent must ensure that the implementation of **stage 4** of the proposal achieves the following environmental outcomes:

(1) **disturb** no more than:

(a) 0.15 **ha** of **mesas, caves, cliffs and free faces (HS) habitat** type;

(b) 3.85 **ha** of **rocky gullies (RG) habitat** type;

(c) 86.7 **ha** of **rocky hills and slopes with low spinifex and scattered trees (RHS) habitat** type;

(d) 90.4 **ha** of **Eucalyptus fringed major drainage lines and associated tributaries (MDE) habitat** type;

(e) 0.03 **ha** of **Melaleuca forest/major drainage lines (MDM) habitat** type; and

(f) 183.3 **ha** of **Floodplains (CP) habitat** type.

(2) no **adverse impacts** to **ghost bat (*Macroderma gigas*) caves** from **construction activities**.

Clearing for construction

B3-2 Prior to **ground disturbing activities** the proponent shall undertake the following actions:

(1) for any clearing proposed during the **grey falcon (*Falco hypoleucos*) nesting period**, within seven (7) days prior to clearing, survey all potential **breeding trees** within the **Eucalyptus fringed major drainage lines and associated tributaries (MDE) habitat** type; and

(2) where nesting grey falcon (*Falco hypoleucos*) are identified under condition B3-2(1), avoid clearing the **breeding tree** until such time that the tree is no longer occupied for breeding by grey falcon (*Falco hypoleucos*).

B3-3 Prior to **ground disturbing activities** the proponent shall undertake the following actions:

(1) within seven (7) days prior to clearing, using a licensed **fauna spotter** undertake **pre-clearance surveys** to detect the presence of northern quoll (*Dasyurus hallucatus*) within:

(a) the **mesas, caves, cliffs and free faces (HS) habitat** type; and

(b) the **rocky gullies (RG) habitat** type.

(2) where northern quoll (*Dasyurus hallucatus*) is detected under condition B3-3(1), **ground disturbing activities** shall not commence until either:

(a) the individual has been relocated by a **fauna spotter;** or

(b) the individual has been observed by the **fauna spotter** to have moved on from the area to adjoining **suitable habitat**; and/or

(c) the **fauna spotter** considers that the individual no longer occurs in the area.

B3-4 The proponent shall undertake the following actions during **construction activities**:

(1) ensure the presence of **fauna spotters** during clearing activities; and

(2) **construction activities** must cease in any area where northern quoll (*Dasyurus hallucatus*) or Pilbara olive python (*Liasis olivaceus barroni*) are identified until:

(a) the individual has been relocated by a **fauna spotter**; or

(b) the individual has been observed by the **fauna spotter** to have moved on from the area to adjoining **suitable habitat;** and/or

(c) the **fauna spotter** considers that the individual no longer occurs in the area.

B3-5 The proponent shall produce and provide a report on fauna management no later than sixty (60) days after the completion of **construction activities** to the **CEO**. The report shall include the following:

(1) details of fauna inspections;

(2) the number and type of fauna removed and relocated and actions taken;

(3) details of the **fauna spotter** commissioned;

(4) results of **pre-clearance surveys**; and

(5) vertebrate fauna mortalities.

B3-6 The proponent shall not undertake any clearing within the **mesas, caves, cliffs and free faces (HS) habitat** type or the **rocky gullies (RG) habitat** type during the **northern quoll (*Dasyurus hallucatus*) breeding season**.

B3-7 The proponent shall not undertake **construction activities** within a one (1) kilometre buffer of the **mesas, caves, cliffs and free faces (HS) habitat** type or **rocky gullies (RG) habitat** type during **night-time** hours.

B3-8 The proponent shall not undertake any **construction activities** within 200 metres of the **ghost bat (*Macroderma gigas*) caves**.

B3-9 Blasting activities shall only take place during **day-time** hours.

B3-10 In the event that blasting is required within 500 metres of **ghost bat (*Macroderma gigas*) caves**, the proponent must prepare an environmental management plan that satisfies the requirements of condition C4 and demonstrates how achievement of the ghost bat (*Macroderma gigas*) environmental outcome in condition B3-1(2) will be monitored and substantiated, and submit it to the **CEO**, on advice of the **DBCA**.

Signage

B3-11 Prior to operation, the proponent must install signage on both sides of the road, alerting road users to the likelihood of encountering northern quoll (*Dasyurus hallucatus*) within a one (1) kilometre buffer of the **mesas, caves, cliffs and free faces (HS) habitat** type or **rocky gullies (RG) habitat** type.

Road fencing

B3-12 Barbed wire fencing, if required, must be installed with the top strand as a single-strand wire and with suitable **bat deflectors**.

Speed limits

B3-13 During construction, vehicle and machinery speed limits within the **stage 4** development envelope shall not exceed:

(1) 80 **km/hr** during **day-time** hours;

(2) 60 **km/hr** at **night-time**; and

(3) 40 **km/hr** at **night-time** within a one (1) kilometre buffer of the **mesas, caves, cliffs and free faces (HS) habitat** type or **rocky gullies (RG) habitat** type.

Lighting

B3-14 The proponent shall ensure that:

(1) there is no permanent lighting established within the **stage 4** development envelope during operation other than required for safety reasons and under other legislation; and

(2) all required artificial lighting used during **construction activities** must use **directional and/or shielded lighting**, and avoid direct light spill

within 500 m **of ghost bat (*Macroderma gigas*) caves** and within **northern quoll (*Dasyurus hallucatus*) critical habitat.**

B4 Inland waters

B4-1 The proponent must implement **stage 4** of the proposal to achieve the following environmental outcomes:

(1) no **adverse impacts** to surface water quality within **Weelamurra Creek**, **Barnett Creek** and **Caves Creek**, and **associated significant drainage lines**;

(2) no **adverse impacts** to surface water flow regimes within **Weelamurra Creek**, **Barnett Creek** and **Caves Creek**, and **associated significant drainage lines**; and

(3) no **adverse impacts** to permanent and semi-permanent pools present within **Weelamurra Creek**.

B4-2 The proponent must prepare an environmental management plan that satisfies the requirements of condition C4 and demonstrates how achievement of the inland waters environmental outcomes in condition B4-1 will be monitored and substantiated, and submit it to the **CEO**.

B5 Aboriginal Cultural Heritage

B5-1 The proponent must implement the proposal to meet the following environmental outcomes:

(1) no **disturbance** of the **HRZ_01 heritage restriction zone**; and

(2) subject to reasonable health and safety requirements, no interruption of ongoing access to land utilised for traditional use or custom by the Yindjibarndi People and/or the Wintawari Guruma People.

B5-2 The proponent must implement the proposal to meet the following environmental objectives:

(1) avoid, where practicable, and otherwise minimise **disturbance** to **significant sites within Eastern Guruma country**;

(2) avoid, where practicable, and otherwise minimise **disturbance** to **significant sites within Yindjibarndi country**;

(3) avoid, where possible, and otherwise minimise indirect impacts to **Aboriginal cultural heritage** within and surrounding the development envelope;

(4) ongoing consultation and engagement with the Wintawari Guruma Traditional Owners regarding the **stage 4** alignment and minimising impacts to the preliminary Four Mile Heritage Restriction Zone; and

(5) ongoing consultation and engagement with Traditional Owners about achievement of the outcomes and objectives in condition B5-1, condition B5-2 and condition B4-1 for the life of the proposal.

B5-3 The proponent must, in consultation with the Yindjibarndi People, revise and update the 'Cultural Heritage Management Plan for the Proposed Stages 3 and 4a Upgrade of the Karratha – Tom Price Road in the Pilbara Region of Western Australia' (Version 2, 2018), to demonstrate how achievement of the social surroundings environmental outcomes will be substantiated, how the social surroundings objectives will be achieved, and satisfy the requirements of conditions C4 and condition C5, and submit it to the **CEO**.

B5-4 The proponent must, in consultation with the Wintawari Guruma People, prepare an Aboriginal heritage management plan that demonstrates how achievement of the social surroundings environmental outcomes will be substantiated, how the social surroundings objectives will be achieved, and satisfies the requirements of condition C4 and condition C5, and submit it to the **CEO**.

B6 Pilbara Environmental Offsets Fund

B6-1 The proponent must contribute funds to the **Pilbara Environmental Offsets Fund** calculated pursuant to condition B6-2, to achieve the objective of counterbalancing the significant residual impacts to:

(1) '**Good' to 'Excellent' condition native vegetation**;

(2) 'Themeda grasslands on cracking clays (Hamersley Station, Pilbara)' threatened ecological community;

(3) 'Brockman Iron cracking clay communities of the Hamersley Range' priority ecological community;

(4) **northern quoll (*Dasyurus hallucatus*) critical habitat**, subject to any reduction approved by the **CEO** under condition B6-8;

(5) **ghost bat (*Macroderma gigas*) critical habitat**, subject to any reduction approved by the **CEO** under condition B6-8; and

(6) **northern quoll (*Dasyurus hallucatus*) supporting habitat**, **ghost bat (*Macroderma gigas*) supporting habitat, Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) supporting habitat** and **Pilbara olive python (*Liasis olivaceus barroni*) supporting habitat**, subject to any reduction approved by the **CEO** under condition B6-8.

B6-2 The proponent's contribution to the **Pilbara Environmental Offsets Fund** must be paid biennially, with the amount to be contributed calculated based on the clearing undertaken in each year of the biennial reporting period in accordance with the rates in condition B6-3. The first biennial reporting period must commence from **ground disturbing activities** of the environmental value(s) identified in condition B6-3.

B6-3 Calculated on the 2021-2022 financial year, the contribution rates are:

(1) $841 AUD (excluding GST) per **ha** of the following environmental values cleared as a result of the proposal within the Chichester **IBRA** subregion:

(a) **'Good' to 'Excellent' condition native vegetation**; and

(b) **northern quoll (*Dasyurus hallucatus*) supporting habitat, ghost bat (*Macroderma gigas*) supporting habitat**, **Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) supporting habitat** and **Pilbara olive python (*Liasis olivaceus barroni*) supporting habitat**.

(2) $890 AUD (excluding GST) per **ha** of the following environmental values cleared as a result of the proposal within the Hamersley **IBRA** subregion:

(a) **'Good' to 'Excellent' condition native vegetation**; and

(b) **northern quoll (*Dasyurus hallucatus*) supporting habitat**, **ghost bat (*Macroderma gigas*) supporting habitat, Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) supporting habitat** and **Pilbara olive python (*Liasis olivaceus barroni*) supporting habitat**.

(3) $1,780 AUD (excluding GST) per **ha** of the following environmental values cleared as a result of the proposal within the Fortescue **IBRA** subregion:

(a) **'Good' to 'Excellent' condition native vegetation**; and

(b) **northern quoll (*Dasyurus hallucatus*) supporting habitat**, **ghost bat (*Macroderma gigas*) supporting habitat**, **Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) supporting habitat** and **Pilbara olive python (*Liasis olivaceus barroni*) supporting habitat**.

(4) $1,780 AUD (excluding GST) per **ha** of the following environmental values cleared as a result of the proposal within the Hamersley **IBRA** subregion:

(a) ‘Themeda grasslands on cracking clays (Hamersley Station, Pilbara)’ threatened ecological community;

(b) ‘Brockman Iron cracking clay communities of the Hamersley Range’ priority ecological community;

(c) **northern quoll (*Dasyurus hallucatus*) critical habitat**; and

(d) **ghost bat (*Macroderma gigas*) critical habitat**.

B6-4 The rates in condition B6-3 change annually each subsequent financial year in accordance with the percentage change in the **CPI** applicable to that financial year.

B6-5 To achieve the objective in condition B6-1 the proponent must prepare a Manuwarra Red Dog Highway Project Impact Reconciliation Procedure and submit to the **CEO**. This procedure must:

(1) spatially define the environmental value(s) identified in condition B6-1;

(2) spatially define the areas where offsets required by condition B6-1 are to be exempt;

(3) include a methodology to calculate the amount of clearing undertaken during each year of the biennial reporting period for each of the environmental values identified in condition B6-3;

(4) state that clearing calculation for the first biennial reporting period will commence from **ground disturbing activities** in accordance with condition B6-2 and end on the second 30 June following commencement of **ground disturbing activities**;

(5) state that clearing calculations for each subsequent biennial reporting period will commence on 1 July of the required reporting period, unless otherwise agreed by the **CEO**; and

(6) be prepared in accordance with Instructions on how to prepare *Environmental Protection Act 1986 Part IV Impact Reconciliation Procedures and Impact Reconciliation Reports* (or any subsequent revisions).

B6-6 The proponent must submit an Impact Reconciliation Report in accordance with the **confirmed** Impact Reconciliation Procedure in condition B6-5.

B6-7 The Impact Reconciliation Report required pursuant to condition B6-6 must provide the location and spatial extent of the clearing undertaken as a result of the proposal during each year of each biennial reporting period.

B6-8 The proponent may apply in writing and seek the written approval of the **CEO** to reduce all or part of the contribution payable under condition B6-2 where:

(1) a payment has been made to satisfy a condition of an approval under the *Environment Protection and Biodiversity Conservation Act 1999* in relation to the proposal; and

(2) the payment is made for the purpose of counterbalancing impacts of the proposal on matters of national environmental significance.

B6-9 The **CEO** may grant approval to discount the amount payable under condition B6-1(4), condition B6-1(5) and condition B6-1(6) if the **CEO** is satisfied that the payment will offset the significant residual impacts of the proposal.

B6-10 Condition C2 applies to the **confirmed** Impact Reconciliation Procedure required by condition B6-5 as if it were an environmental management plan.

B6-11 Failure to implement a **confirmed** Impact Reconciliation Procedure or submit an Impact Reconciliation Report as required by condition B6-6 represents a non-compliance with these conditions.

B7 Original proposal environmental management plans

B7-1 The proponent is required to implement the post-construction requirements of the following management plans for **stage 3,** which the **CEO** has approved in writing:

(1) Karratha Tom Price Stage 3a South, 3b and 4a Vegetation Protection and Rehabilitation Management Plan (Version 2, 2018);

(2) Karratha Tom Price Stage 3a North Vegetation Protection and Rehabilitation Management Plan (Version 3, December 2018);

(3) Weed Control and Management Program Karratha Tom Price Stages 3 and 4a (Version 1, 2018);

(4) Karratha Tom Price Stage 3 and 4a Surface Drainage Management Plan (Version 3, 2018); and

(5) Karratha Tom Price Stage 3a North National Park Management Plan (Version 3, 2018).

PART C – ENVIRONMENTAL MANAGEMENT PLANS AND MONITORING

C1 Environmental Management Plans: Conditions Related to Commencement of Implementation of the Proposal

C1-1 The proponent must not undertake:

(1) **ground disturbing activities** that may result in any impact to the environmental values specified under condition B2-1(4) or condition B4-1 until the **CEO** has confirmed in writing that the environmental management plan(s) required by condition B2-2 and condition B4-2 meets the requirements of that condition and condition C4;

(2) blasting activities until the **CEO** has confirmed in writing that the environmental management plan required by condition B3-10 meets the requirements of that condition and condition C4;

(3) **ground disturbing activities** within **Yindjibarndi country** that may result in any impact to **Aboriginal cultural heritage** until the **CEO** has confirmed in writing that the environmental management plan required by condition B5-3 meets the requirements of that condition and condition C4 and C5;

(4) **ground disturbing activities** within **Eastern Guruma country** that may result in any impact to **Aboriginal cultural heritage** until the **CEO** has confirmed in writing that the environmental management plan required by condition B5-4 meets the requirements of that condition and condition C4 and C5; and

(5) **ground disturbing activities** until the **CEO** has confirmed in writing that the Manuwarra Red Dog Highway Project Impact Reconciliation Procedure required by condition B6-5 meets the requirements of that condition.

C2 Environmental Management Plans: Conditions Relating to Approval, Implementation, Review and Publication

C2-1 Upon being required to implement an environmental management plan under Part B, or after receiving notice in writing from the **CEO** under condition C1-1 that the environmental management plan(s) required in Part B satisfies the relevant requirements, the proponent must:

(1) implement the most recent version of the **confirmed** environmental management plan; and

(2) continue to implement the **confirmed** environmental management plan referred to in condition C2-1(1), other than for any period which the **CEO** confirms by notice in writing that it has been demonstrated that the

relevant requirements for the environmental management plan have been met, or are able to be met under another statutory decision-making process, in which case the implementation of the environmental management plan is no longer required for that period.

C2-2 The proponent:

(1) may review and revise a **confirmed** environmental management plan provided it meets the relevant requirements of that environmental management plan, including any consultation that may be required when preparing the environmental management plan; and

(2) must review and revise a **confirmed** environmental management plan and ensure it meets the relevant requirements of that environmental management plan, including any consultation that may be required when preparing the environmental management plan, as and when directed by the **CEO**.

C2-3 Despite condition C2-1, but subject to conditions C2-4 and C2-5, the proponent may implement minor revisions to an environmental management plan if the revisions will not result in new or increased **adverse impacts** to the environment or result in a risk to the achievement of the limits, outcomes or objectives which the environmental management plan is required to achieve.

C2-4 If the proponent is to implement minor revisions to an environmental management plan under condition C2-3, the proponent must provide the **CEO** with the following at least twenty (20) business days before it implements the revisions:

(1) the revised environmental management plan clearly showing the minor revisions;

(2) an explanation of and justification for the minor revisions; and

(3) an explanation of why the minor revisions will not result in new or increased **adverse impacts** to the environment or result in a risk to the achievement of the limits, outcomes or objectives which the environmental management plan is required to achieve.

C2-5 The proponent must cease to implement any revisions which the **CEO** notifies the proponent (at any time) in writing may not be implemented.

C2-6 **Confirmed** environmental management plans, and any revised environmental management plans under condition C2-4(1), must be published on the proponent's website and provided to the **CEO** in electronic form suitable for on-line publication by the Department of Water and Environmental Regulation

within twenty (20) business days of being implemented, or being required to be implemented (whichever is earlier).

C3 Conditions Related to Monitoring

C3-1 The proponent must undertake monitoring capable of:

(1) substantiating whether the proposal limitations and extents in Part A are exceeded; and

(2) **detecting** and substantiating whether the environmental outcomes identified in Part B are achieved (excluding any environmental outcomes in Part B where an environmental management plan is expressly required to monitor achievement of that outcome).

C3-2 The proponent must submit as part of the Compliance Assessment Report required by condition D2, a compliance monitoring report that:

(1) outlines the monitoring that was undertaken during the implementation of the proposal;

(2) identifies why the monitoring was capable of substantiating whether the proposal limitation and extents in Part A are exceeded;

(3) for any environmental outcomes to which condition C3-1(2) applies, identifies why the monitoring was scientifically robust and capable of **detecting** whether the environmental outcomes in Part B are met;

(4) outlines the results of the monitoring;

(5) reports whether the proposal limitations and extents in Part A were exceeded and (for any environmental outcomes to which condition C3-1 (2) applies) whether the environmental outcomes in Part B were achieved, based on analysis of the results of the monitoring; and

(6) reports any actions taken by the proponent to remediate any potential non-compliance.

C4 Environmental Management Plans: Conditions Relating to Monitoring and Adaptive Management for Outcomes Based Conditions

C4-1 The environmental management plan(s) required under condition B2-2 and condition B4-2, and the environmental management plans required under condition B3-10, condition B5-3 and condition B5-4 must contain provisions which enable the substantiation of whether the relevant outcomes of those conditions are met, and must include:

(1) **threshold criteria** that provide a limit beyond which the environmental outcomes are not achieved;

(2) **trigger criteria** that will provide an early warning that the environmental outcomes are not likely to be met;

(3) monitoring parameters, sites, control/reference sites, methodology, timing and frequencies which will be used to measure **threshold criteria** and **trigger criteria**. Include methodology for determining alternate monitoring sites as a contingency if proposed sites are not suitable in the future;

(4) baseline data;

(5) data collection and analysis methodologies;

(6) adaptive management methodology;

(7) **contingency measures** which will be implemented if **threshold criteria** or **trigger criteria** are not met; and

(8) reporting requirements.

C4-2 Without limiting condition C3-1, failure to achieve an environmental outcome, or the exceedance of a **threshold criteria**, regardless of whether threshold **contingency measures** have been or are being implemented, represents a non-compliance with these conditions.

C5 Environmental Management Plans: Conditions Related to Management Actions and Targets for Objective Based Conditions

C5-1 The environmental management plans required under condition B5-3 and condition B5-4 must contain provisions which enable the achievement of the relevant objectives of those conditions and substantiation of whether the objectives are reasonably likely to be met, and must include:

(1) **management actions**;

(2) **management targets**;

(3) **contingency measures** if **management targets** are not met; and

(4) reporting requirements.

C5-2 The environmental management plans required under condition B5-3 and condition B5-4 are also required to include a map that shows the areas or site of **Aboriginal cultural heritage** significance that will be avoided.

C5-3 Without limiting condition C2-1, the failure to achieve an environmental objective, or implement a **management action**, regardless of whether **contingency measures** have been or are being implemented, represents a non-compliance with these conditions.

PART D – COMPLIANCE, TIME LIMITS, AUDITS AND OTHER CONDITIONS

D1 Non-compliance Reporting

D1-1 If the proponent becomes aware of a potential non-compliance, the proponent must:

(1) report this to the **CEO** within seven (7) days;

(2) implement **contingency measures**;

(3) investigate the cause;

(4) investigate environmental impacts;

(5) advise rectification measures to be implemented;

(6) advise any other measures to be implemented to ensure no further impact; and

(7) provide a report to the **CEO** within twenty-one (21) days of being aware of the potential non-compliance, detailing the measures required in conditions D1-1(2) to D1-1(6) above.

D1-2 Failure to comply with the requirements of a condition, or with the content of an environmental management required under a condition, constitutes a non-compliance with these conditions, regardless of whether the **contingency measures**, rectification or other measures in condition D1-1 above have been or are being implemented.

D2 Compliance Reporting

D2-1 The proponent must provide an annual Compliance Assessment Report to the **CEO** for the purpose of determining whether the implementation conditions are being complied with.

D2-2 Unless a different date or frequency is approved by the **CEO**, the first annual Compliance Assessment Report must be submitted within fifteen (15) months of the date of this Statement, and subsequent plans must be submitted annually from that date.

D2-3 Each annual Compliance Assessment Report must be endorsed by the proponent's Chief Executive Officer, or a person approved by proponent's Chief Executive Officer to be delegated to sign on the Chief Executive Officer's behalf.

D2-4 Each annual Compliance Assessment Report must:

(1) state whether each condition of this Statement has been complied with, including:

(a) exceedance of any proposal limits and extents;

(b) achievement of environmental outcomes;

(c) achievement of environmental objectives;

(d) requirements to implement the content of environmental management plans;

(e) monitoring requirements;

(f) implement **contingency measures**;

(g) requirements to implement adaptive management; and

(h) reporting requirements;

(2) include the results of any monitoring (inclusive of any raw data) that has been required under Part C in order to demonstrate that the limits in Part A, and any outcomes or any objectives are being met;

(3) provide evidence to substantiate statements of compliance, or details of where there has been a non-compliance;

(4) include the corrective, remedial and preventative actions taken in response to any potential non-compliance;

(5) be provided in a form suitable for publication on the proponent's website and online by the Department of Water and Environmental Regulation; and

(6) be prepared and published consistent with the latest version of the Compliance Assessment Plan required by condition D2-5 which the **CEO** has confirmed by notice in writing satisfies the relevant requirements of Part C and Part D of this statement.

D2-5 The proponent must prepare a Compliance Assessment Plan which is submitted to the **CEO** at least six (6) months prior to the first Compliance Assessment Report required by condition D2-2, or prior to implementation of the proposal, whichever is sooner.

D2-6 The Compliance Assessment Plan must include:

(1) what, when and how information will be collected and recorded to assess compliance;

(2) the methods which will be used to assess compliance;

(3) the methods which will be used to validate the adequacy of the compliance assessment to determine whether the implementation conditions are being complied with;

(4) the retention of compliance assessments;

(5) the table of contents of Compliance Assessment Reports, including audit tables; and

(6) how and when Compliance Assessment Reports will be made publicly available, including usually being published on the proponent's website within sixty (60) days of being provided to the **CEO**.

D3 Contact Details

D3-1 The proponent must notify the **CEO** of any change of its name, physical address or postal address for the serving of notices or other correspondence within twenty-eight (28) days of such change. Where the proponent is a corporation or an association of persons, whether incorporated or not, the postal address is that of the principal place of business or of the principal office in the State.

D4 Time Limit for Proposal Implementation

D4-1 **Stage 4** of the proposal must be substantially commenced within five (5) years from the date of this Statement.

D4-2 The proponent must provide to the **CEO** documentary evidence demonstrating that they have complied with condition D4-1 no later than fourteen (14) days after the expiration of period specified in condition D4-1.

D4-3 If the proposal has not been substantially commenced within the period specified in condition D4-1, implementation of the proposal must not be commenced or continued after the expiration of that period.

D5 Public Availability of Data

D5-1 Subject to condition D5-2, within a reasonable time period approved by the **CEO** upon the issue of this Statement and for the remainder of the life of the proposal, the proponent must make publicly available, in a manner approved by the **CEO**, all validated environmental data collected before and after the date of this Statement relevant to the proposal (including sampling design, sampling methodologies, monitoring and other empirical data and derived information products (e.g. maps)), environmental management plans and reports relevant to the assessment of this proposal and implementation of this Statement.

D5-2 If:

(1) any data referred to in condition D6-1 contains trade secrets; or

(2) any data referred to in condition D6-1 contains particulars of confidential information (other than trade secrets) that has commercial value to a person that would be, or could reasonably be expected to be, destroyed or diminished if the confidential information were published,

the proponent may submit a request for approval from the **CEO** to not make this data publicly available and the **CEO** may agree to such a request if the **CEO** is satisfied that the data meets the above criteria.

D5-3 In making such a request the proponent must provide the **CEO** with an explanation and reasons why the data should not be made publicly available.

D6 Independent Audit

D6-1 The proponent must arrange for an independent audit of compliance with the conditions of this statement, including achievement of the environmental outcomes and/or the environmental objectives and/ or environmental performance with the conditions of this statement, as and when directed by the **CEO**.

D6-2 The independent audit must be carried out by a person with appropriate qualifications who is nominated or approved by the **CEO** to undertake the audit under condition D6-1.

D6-3 The proponent must submit the independent audit report with the Compliance Assessment Report required by condition D2, or at any time as and when directed in writing by the **CEO**. The audit report is to be supported by credible evidence to substantiate its findings.

D6-4 The independent audit report required by condition D6-1 is to be made publicly available in the same timeframe, manner and form as a Compliance Assessment Report, or as otherwise directed by the **CEO**.

Table 1: Abbreviations and definitions

Acronym or abbreviation	Definition or term
Aboriginal cultural heritage	Means the tangible and intangible elements that are important to the Aboriginal people of the State, and are recognised through social, spiritual, historical, scientific or aesthetic values, as part of Aboriginal tradition to the extent they directly affect or are affected by physical or biological surroundings.
Adverse impacts	Negative change that is neither trivial nor negligible that could result in a reduction in health, diversity or abundance of the receptor/s being impacted, or a reduction in **environmental value**. Adverse impacts for vegetation can arise from direct or indirect disturbance, or other impacts from the proposal such as (but not limited to) hydrological change, spread or introduction of **environmental weeds**, altered fire regimes, introduction or spread of disease, changes in erosion/deposition/accretion and edge effects. Adverse impacts for terrestrial fauna can arise from direct or indirect disturbance, or other impacts from the proposal such as (but not limited to) vehicle strike, collision with fencing, habitat fragmentation, artificial light and vibration and noise emissions.
Associated significant drainage lines	Major drainage lines associated with Weelamurra Creek, Caves Creek and/or Barnett Creek.
Barnett Creek	Major watercourse identified in Figure 1 of the Fortescue River, Weelamurra Creek and Caves Creek Waterways Summary Report, Manuwarra Red Dog Highway Stage 4 (April 2022).
Baseline biological survey	The flora and vegetation survey results, and fauna survey results, and supporting spatial data described in the report *Manuwarra Red Dog Highway Stage 4 Biological Survey,* by Biota 2022.
Bat deflectors	A device that can be attached to fencing to increase visibility of the wires to reduce potential mortality and entanglement, and can include items such as a metal disc (10 x 10 cm) between the top and second strand.
Breeding tree/s	Trees that are suitable for use as breeding habitat by grey falcon (*Falco hypoleucos*).
Caves Creek	Major watercourse identified in Figure 1 of the Fortescue River, Weelamurra Creek and Caves Creek Waterways Summary Report, Manuwarra Red Dog Highway Stage 4 (April 2022).
CEO	The Chief Executive Officer of the Department of the Public Service of the State responsible for the administration of section 48 of the *Environmental Protection Act 1986*, or the **CEO's** delegate.

Confirmed	In relation to a plan required to be made and submitted to the **CEO**, means, at the relevant time, the plan that the **CEO** confirmed, by notice in writing, meets the requirements of the relevant condition. In relation to a plan required to be implemented without the need to be first submitted to the **CEO**, means that plan until it is revised, and then means, at the relevant time, the plan that the **CEO** confirmed, by notice in writing, meets the requirements of the relevant condition.
Construction activities	Activities that are associated with the substantial implementation of **stage 4** of the proposal, including but not limited to, earthmoving, blasting, vegetation clearing, grading or construction of right of way. Construction activities do not include geotechnical investigations (including potholing for services and the installation of piezometers) and other preconstruction activities where no clearing of vegetation is required.
CPI	The All Groups Consumer Price Index numbers for Perth compiled and published by the Australian Bureau of Statistics.
Contingency measures	Planned actions for implementation if it is identified that an environmental outcome, environmental objective, **threshold criteria** or **management target** are likely to be, or are being, exceeded. Contingency measures include changes to operations or reductions in disturbance to reduce impacts and must be decisive actions that will quickly bring the impact to below any relevant threshold, **management target** and to ensure that the environmental outcome and/or objective can be met.
Day-time	The period between sunrise and sunset on any given day.
DBCA	The Department of Biodiversity, Conservation and Attractions
Detecting/ Detectable	The smallest statistically discernible effect size that can be achieved with a monitoring strategy designed to achieve a statistical power value of at least 0.8 or an alternative value as determined by the **CEO**.
Directional and/or shielded lighting	Means light fittings that are located, directed, or shielded to avoid lighting anything but the target object or area as described in the *National Light Pollution Guidelines for Wildlife* (January 2020).
Disturb/ disturbance	Flora – result in death, destruction, removal, severing or doing substantial damage to (*from EP Act clearing*) Fauna – has the effect of altering the natural behaviour of fauna to its detriment (*from BC Act*) Direct – causes or immediately has the disturbance effect. Indirect – materially contributes to the disturbance effect.
Eastern Guruma country	The area within the Eastern Guruma (WCD2007/001) native title determination area of the Wintawari Guruma People.
Environmental value	A beneficial use, or ecosystem health condition.

Environmental weeds	Any plant declared under section 22(2) of the *Biosecurity and Agriculture Management Act 2007*, any plant listed on the Weeds of National Significance List and any weeds listed on the Department of Biodiversity, Conservation and Attractions' Pilbara Impact and Invasiveness Ratings list, as amended or replaced from time to time.
***Eucalyptus* fringed major drainage lines and associated tributaries (MDE) habitat**	The area defined as the habitat type "Eucalyptus fringed major drainage lines and associated tributaries (MDE)" in the report and supporting spatial data in the *Manuwarra Red Dog Highway Stage 4 Biological Survey,* by Biota 2022.
Fauna spotter	A person who is qualified and has attained the appropriate licence/s and authorisation/s under the *Biodiversity Conservation Act 2016* and the Biodiversity Conservation Regulation 2018.
Floodplains (CP) habitat	The area defined as the habitat type "Floodplains (CP)" in the report and supporting spatial data in the *Manuwarra Red Dog Highway Stage 4 Biological Survey,* by Biota 2022.
Ghost bat (*Macroderma gigas*) caves	Three caves showing evidence of ghost bat (*Macroderma gigas*) use, as shown in Map 8 and Map 9 of the **baseline biological survey.**
Ghost bat (*Macroderma gigas*) critical habitat	All **floodplains (CP)**, **mesas, caves, cliffs and free faces (HS)**, **rocky gullies (RG)**, **rocky hills and slopes with low spinifex and scattered trees (RHS)**, **Eucalyptus fringed major drainage lines and associated tributaries (MDE)**, **Melaleuca forest/major drainage lines (MDM)**, and **man-made water bodies (MMW)** habitat types within a 12 km radius of **ghost bat caves**.
Ghost Bat (*Macroderma gigas*) supporting habitat	All **floodplains (CP)**, **mesas, caves, cliffs and free faces (HS)**, **rocky gullies (RG)**, **rocky hills and slopes with low spinifex and scattered trees (RHS)**, **Eucalyptus fringed major drainage lines and associated tributaries (MDE)**, **Melaleuca forest/major drainage lines (MDM)**, and **man-made water bodies (MMW)** habitat types outside of a **ghost bat (*Macroderma gigas*) critical habitat**.
'Good'/'Good' to 'Excellent' condition native vegetation	The condition of native vegetation rated in accordance with the *Technical guidance – Flora and vegetation surveys for environmental impact assessment (EPA 2016)* including any revision to this technical guidance.
Grey falcon (*Falco hypoleucos*) nesting period	The period between 1 June and 30 November in any calendar year.
Ground disturbing activities	Any activity undertaken in the implementation of **stage 4** of the proposal, including any clearing, civil works or construction.

Ha	Hectare.
HRZ_01 heritage restriction zone	Site identified as HRZ_01 in the Yulur Heritage Report titled ‘‘Report on the Trip 3 site avoidance archaeological heritage survey of the Manuwarra Red Dog Highway Karratha Tom Price Road Stage 4 Alignment Tom Price Railway Rd SLK38-51 undertaken in Eastern Guruma Country by the Wintawari Guruma representatives and Yulur Heritage’ (Version 1, 2021).
IBRA	Interim Biogeographic Regionalisation for Australia.
Km/hr	Kilometre per hour.
Management action/s	The identified actions implemented with the intent of to achieving the environmental objective.
Management target/s	A type of indicator to evaluate whether an environmental objective is being achieved.
***Melaleuca* forest/major drainage lines (MDM) habitat**	The area defined as the habitat type “Melaleuca forest/major drainage lines (MDM)” in the report and supporting spatial data in the *Manuwarra Red Dog Highway Stage 4 Biological Survey,* by Biota 2022.
Mesas, caves, cliffs and free faces (HS) habitat	The area defined as the habitat type “Mesas, caves, cliffs and free faces (HS)” in the report and supporting spatial data in the *Manuwarra Red Dog Highway Stage 4 Biological Survey,* by Biota 2022.
Night-time	The period between sunset and sunrise on any given day.
Northern quoll (*Dasyurus hallucatus*) breeding season	Means the time of year that quolls become sexually active, which is from 1 June to 31 December in any calendar year.
Northern quoll (*Dasyurus hallucatus*) critical habitat	**Mesas, caves, cliffs and free faces (HS)** and **rocky gullies (RG)** habitat types, and all other supporting habitat within a one (1) kilometre radius of the **Mesas, caves, cliffs and free faces (HS)** and **rocky gullies (RG)** habitat types, as identified in the **baseline biological survey**.
Northern quoll (*Dasyurus hallucatus*) supporting habitat	All **rocky hills and slopes with low spinifex and scattered trees (RHS)**, **Eucalyptus fringed major drainage lines and associated tributaries (MDE)** and **Melaleuca forest/major drainage lines (MDM)** habitat types outside of **northern quoll (*Dasyurus hallucatus*) critical habitat**.
Pilbara Environmental Offsets Fund	A special purpose account created pursuant to section 16(1)(d) of the *Financial Management Act 2006* by the Department of Water and Environmental Regulation.
Pilbara leaf-nosed bat	All **mesas, caves, cliffs and free faces (HS)**, **rocky gullies (RG)** **rocky hills and slopes with low spinifex and scattered trees**

(*Rhinonicteris aurantia*) supporting habitat	**(RHS)**, **Eucalyptus fringed major drainage lines and associated tributaries (MDE)** and **Melaleuca forest/major drainage lines (MDM)** habitat types.
Pilbara olive python (*Liasis olivaceus barroni*) supporting habitat	All **floodplains (CP)**, **mesas, caves, cliffs and free faces (HS)**, **rocky gullies (RG)**, **rocky hills and slopes with low spinifex and scattered trees (RHS)**, **Eucalyptus fringed major drainage lines and associated tributaries (MDE)** and **Melaleuca forest/major drainage lines (MDM)** habitat types.
Pre-clearance surveys	Surveys designed to identify the presence or evidence of threatened fauna listed under the *Biodiversity Conservation Act 2016* prior to **ground disturbing activities**.
Rocky gullies (RG) habitat	The area defined as the habitat type "Rocky gullies (RG)" in the report and supporting spatial data in the *Manuwarra Red Dog Highway Stage 4 Biological Survey,* by Biota 2022.
Rocky hills and slopes with low spinifex and scattered trees (RHS) habitat	The area defined as the habitat type "Rocky hills and slopes with low spinifex and scattered trees (RHS)" in the report and supporting spatial data in the *Manuwarra Red Dog Highway Stage 4 Biological Survey,* by Biota 2022.
Significant sites within Eastern Guruma country	Sites identified as *BJD08_45*, *HRZ_01*, *MR_EAS_21_001*, *MR_EAS_21_002, MR_EAS_21_003, MR_EAS_21_004, MR_EAS_21_005, MR_EAS_21_006, MR_EAS_21_007*, *MR_EAS_21_008*, *MR_EAS_21_009*, *MR_EAS_21_010*, *MR_EAS_21_011*, *MR_EAS_21_012, S11-181*, *Mount Margaret 96-1 (Hamersley Plateau), Weelamurra Ceremonial HRZ, Weelamurra Creek Ceremonial Ground*, *Hawk Pool Restriction Zone,* and *Four Mile Heritage Restriction Zone (preliminary)* in the following reports: • 'Report on a site avoidance archaeological heritage survey of the Karratha Tom Price Road Stage 4 Alignment Tom Price Railway Rd SLK0-51 undertaken in Eastern Guruma Country by the Wintawari Guruma representatives and Yulur Heritage' (Version 1, 2020); • 'Report on the trip 2 site avoidance and archaeological heritage survey of the Manuwarra Red Dog Highway Karratha Tom Price Road Stage 4 Alignment Tom Price Railway Rd SLK0-50 undertaken in Eastern Guruma Country by the Wintawari Guruma representatives and Yulur Heritage' (Version 1, 2021); and • Report on the Trip 3 site avoidance archaeological heritage survey of the Manuwarra Red Dog Highway Karratha Tom Price Road Stage 4 Alignment Tom Price Railway Rd SLK38-51 undertaken in Eastern Guruma Country by the Wintawari Guruma representatives and Yulur Heritage (Version 1, 2021).

Significant sites within Yindjibarndi country	Sites identified as *MR_YIN_20_001, MR_YIN_20_002, MR_YIN_20_003, MR_YIN_20_004, MR_YIN_20_005, MR_YIN_20_006, MR_YIN_20_007, MR_YIN_20_008, MR_YIN_20_009, MR_YIN_20_010, MR_YIN_20_011, MR_YIN_20_012, MR_YIN_20_013 and MR_YIN_20_014, MR_YIN_20_015, MR_YIN_21_001, MR_YIN_21_002, MR_YIN_21_003, MR_YIN_21_004,* and *RTF04-01*, in the following reports: • 'Report of an Aboriginal archaeological Site Avoidance survey of works associated with the Karratha to Tom Price Road Stage 4 Alignment Corridor (Roebourne Wittenoom Rd SLK58-74 & Tom Price Railway Rd SLK51-106), Pilbara, Western Australia. Trip 1' (2020); • 'Report of an Aboriginal archaeological Site Avoidance survey of works associated with the Karratha to Tom Price Road Stage 4 Alignment Corridor (Roebourne Wittenoom Rd SLK68-74 & Tom Price Railway Rd SLK51-108), Pilbara, Western Australia. Trip 2' (2020); • 'Report of an Aboriginal archaeological Site Avoidance survey of works associated with the Karratha to Tom Price Road Stage 4 Alignment Corridor (Roebourne Wittenoom Rd SLK68-74 & Tom Price Railway Rd SLK51-108), Pilbara, Western Australia. Trip 3' (2021); • 'Report of an Aboriginal archaeological Site Avoidance survey of works associated with the Karratha to Tom Price Road Stage 4 Alignment Corridor (Roebourne Wittenoom Rd SLK68-74 & Tom Price Railway Rd SLK51-108), Pilbara, Western Australia. Trip 4' (2021); and • 'Report of an Aboriginal archaeological Site Avoidance survey of works associated with the Karratha to Tom Price Road Stage 4 Alignment Corridor (Roebourne Wittenoom Rd SLK68-74 & Tom Price Railway Rd SLK51-108), Pilbara, Western Australia. Trip 5' (2021).
Stage 3	Stage 3 of the Manuwarra Red Dog Highway Project as shown in Figure 2 and defined by coordinates in Schedule 1.
Stage 4	Stage 4 of the Manuwarra Red Dog Highway project, as shown within Figure 1 and defined by coordinates in Schedule 1.
Suitable habitat	Any habitat known to support northern quoll (*Dasyurus hallucatus*) or Pilbara olive python (*Liasis olivaceus barroni*).
Threshold criteria	The indicators that have been selected to represent limits of impact beyond which the environmental outcome is not being met.
Trigger criteria	Indicators that have been selected for monitoring to provide a warning that if exceeded the environmental outcome may not be achieved. They are intended to forewarn of the approach of the **threshold criteria** and trigger response actions.

Yindjibarndi country	The combined Ngarluma/Yindjibarndi (WCD2005/001) native title determination area and the Yindjibarndi #1 (WCD2017/010) native title determination area of the Yindjibarndi People.
Weelamurra Creek	Major watercourse identified in Figure 1 of the Fortescue River, Weelamurra Creek and Caves Creek Waterways Summary Report, Manuwarra Red Dog Highway Stage 4 (April 2022).

Figures (attached)

Figure 1 Stage 4 development envelope (This map is a representation of the co-ordinates referenced in Schedule 1)

Figure 2 Development envelope for stage 2, stage 3 and stage 4 (This map is a representation of the co-ordinates referenced in Schedule 1)

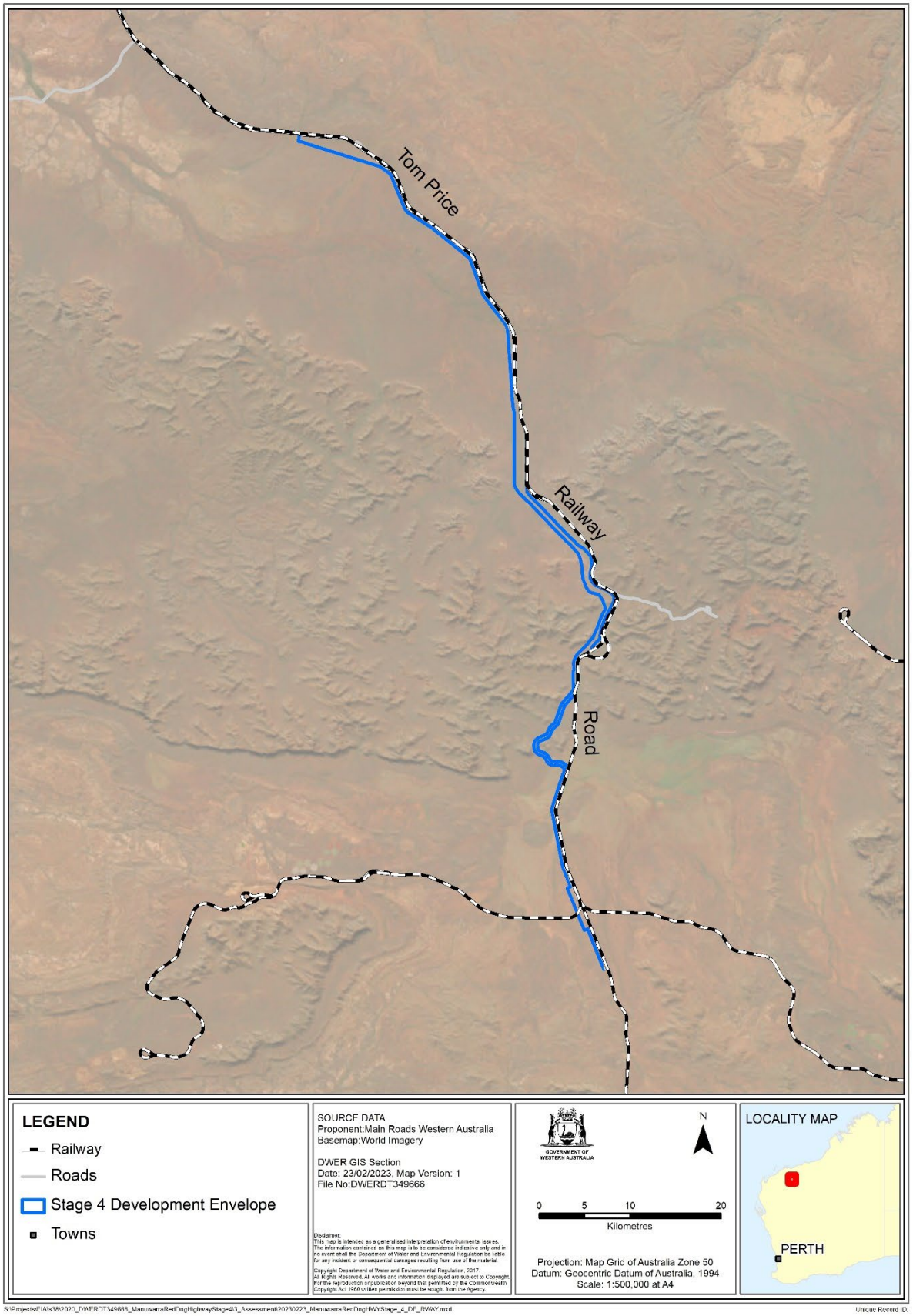

Figure 1. Stage 4 development envelope

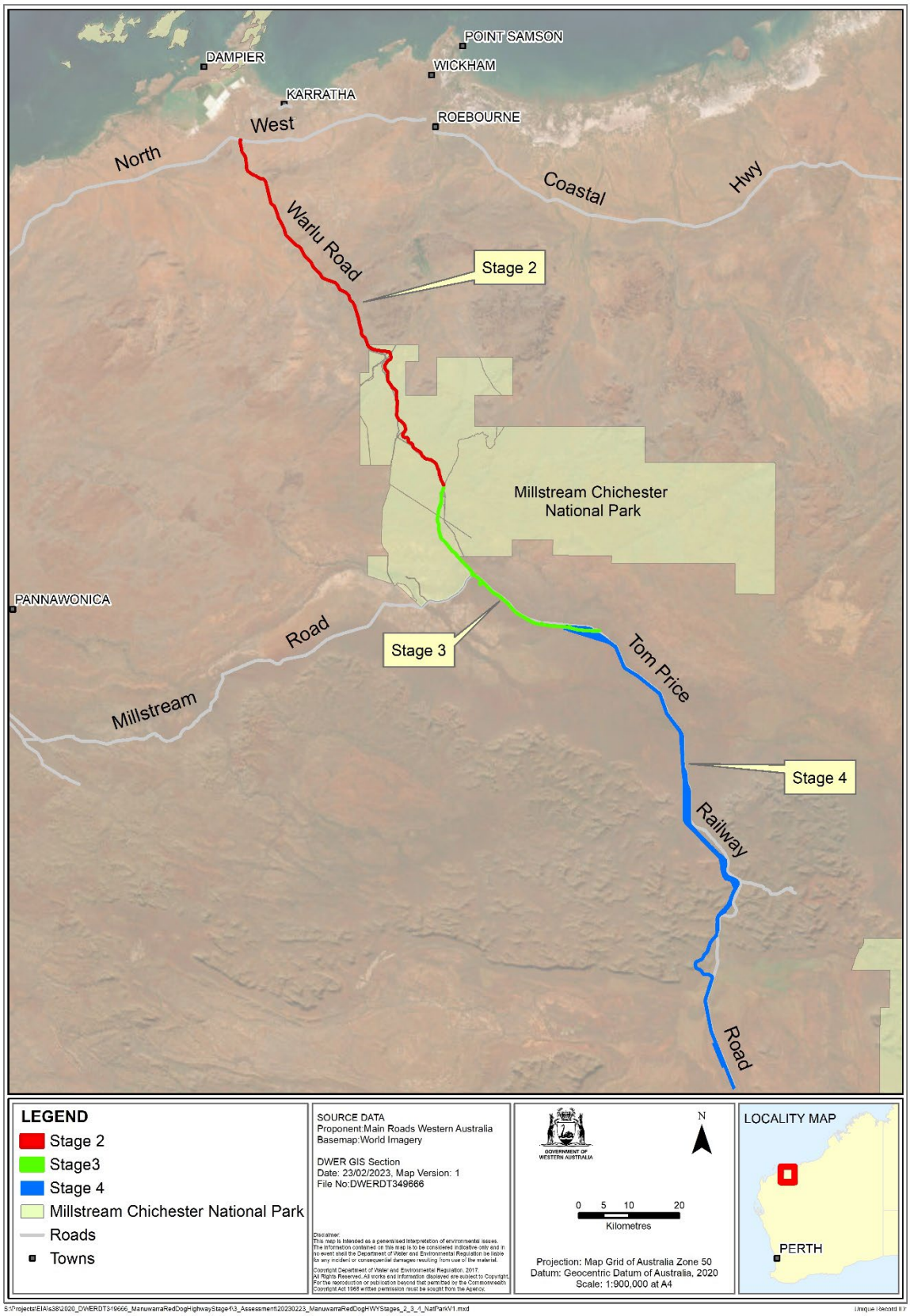

Figure 2. Development envelope for stage 2, stage 3 and stage 4

Schedule 1

All co-ordinates are in metres, listed in Map Grid of Australia Zone 50 (MGA Zone 50), datum of Geocentric Datum of Australia 1994 (GDA94).

Spatial data depicting the figures are held by the Department of Water and Environmental regulation. Record no. A2163982.

Appendix B: Decision-making authorities

Table B1: Identified relevant decision-making authorities for the proposal

Decision-Making Authority	Legislation (and approval)
1. Minister for Aboriginal Affairs	*Aboriginal Heritage Act 1972* - section 18 consent to impact a registered Aboriginal heritage site)
2. Minister for Environment	*Biodiversity Conservation Act 2016* - section 40 authority to take or disturb threatened species and - section 45 authority to modify occurrence of a threatened ecological community
3. Minister for Transport	*Main Roads Act 1930* - section 22 approval to construct roads
4. Minister for Water	*Rights in Water and Irrigation Act 1914* - permit to interfere with beds and banks - licence to take water - groundwater abstraction licence - licence to construct bores - dewatering licence
5. Chief Executive Officer, Department of Biodiversity, Conservation and Attractions	*Biodiversity Conservation Act 2016* - authority to take flora and fauna (other than threatened species)

Appendix C: Environmental Protection Act principles

Table C1: Consideration of principles of the *Environmental Protection Act 1986*

EP Act principle	Consideration
1. The precautionary principle *Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.* *In application of this precautionary principle, decisions should be guided by –* *(a) careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and* *(b) an assessment of the risk-weighted consequences of various options.*	The EPA has considered the precautionary principle in its assessment and has had particular regard to this principle in its assessment of flora and vegetation, terrestrial fauna, inland waters, and social surroundings. The assessment of these impacts is provided in this report. The proponent has investigated the biological and physical environment to identify environmental values of the proposal area. The EPA notes that the proponent has undertaken avoidance and mitigation measures to avoid potential serious or irreversible damage to the environment by: • locating the proposal close to existing infrastructure where indirect impacts have occurred wherever possible; and limiting and reducing the extent of impact to significant ecological communities, locally significant vegetation, significant flora species and significant terrestrial fauna habitat • undertaking extensive cultural heritage surveys and engaging in meaningful consultation with the various Traditional Owner groups that have ongoing connection to Country along the proposed alignment to ensure serious or irreversible damage of important cultural heritage sites can be avoided and cultural practices can be maintained. The EPA has recommended conditions, including requirements for monitoring during the implementation of the proposal, to ensure environmental outcomes are achieved.
2. The principle of intergenerational equity *The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations.*	The EPA has considered the principle of intergenerational equity in its assessment and has had particular regard to this principle in its assessment of flora and vegetation, terrestrial fauna, inland waters, and social surroundings. The EPA considers consistency with this principle could be achieved with the implementation of its recommended conditions, which requires the proponent to:

EP Act principle	Consideration
	• co-develop and implement Aboriginal Heritage management plans with relevant Traditional Owners prior to ground-disturbing activities • limit the extent of disturbance to flora, vegetation, and fauna habitat types and ensure no adverse impacts to significant environmental values • contribute to the PEOF for future landscape-scale environmental offset projects, to counterbalance the significant residual impact to vegetation and threatened fauna habitats within the Pilbara. The EPA concluded that the environmental values will be protected, and the health, diversity and productivity of the environment will be maintained for the benefit of future generations.
3. The principles of the conservation of biological diversity and ecological integrity *Conservation of biological diversity and ecological integrity should be a fundamental consideration.*	The EPA has considered the principle of conservation of biological diversity and ecological integrity in its assessment and has had particular regard to this principle in its assessment of flora and vegetation, terrestrial fauna, and inland waters. The EPA has considered the proponent's commitment to locate the final alignment to minimise impacts to environmental values as much as practicable given the constraints of the location. The EPA has also considered to what extent the potential impacts from the proposal to these environmental factors can be ameliorated, to ensure consistency with this principle, including by provision of offsets. The EPA has concluded that given the nature of the impacts that the proposed offsets are likely to counter-balance the impacts of the loss of biological diversity and ecological integrity.
4. Principles relating to improved valuation, pricing and incentive mechanisms *Environmental factors should be included in the valuation of assets and services.* *The polluter pays principle — those who generate pollution and waste should bear the cost of containment, avoidance or abatement.*	The EPA has had regard to this principle during the assessment. In considering this principle, the EPA notes that the proponent will bear the costs relating to implementing the proposal to achieve environmental outcomes and management and monitoring of environmental impacts during construction, operation and decommissioning of the proposal. The ultimate alignment of stage 4 of the amended proposal will have consideration for and a focus on reducing direct and indirect clearing impacts, and incorporate the cost of environmental impact mitigation, management, and maintenance activities.

EP Act principle	Consideration
The users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any wastes. *Environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structures, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solutions and responses to environmental problems.*	The proponent's sustainability charter for the proposal incorporates principles to guide decision making to enhance biodiversity and environmental outcomes and integrate sustainability into procurement, product life cycles and supply chains.
5. The principle of waste minimisation *All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.*	The EPA has considered the principle of waste minimisation in its assessment. In considering this principle, the EPA notes the proponent's commitment to, where practicable, source fill material from areas of cut along the alignment. This will minimise the requirement to export excess fill off site to a disposal facility. The proponent has further committed to ensuring appropriate waste management and minimisation practices are in place during construction and promoting a circular economy to drive innovation in waste reduction.

Appendix D: Other environmental factors

Table D1: Evaluation of other environmental factors

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Government agency and public comments	Evaluation of why the factor is not a key environmental factor
Air			
Greenhouse gas emissions (GHG)	Construction Stages 2 and 3 are already constructed and therefore were not included in the proponent's GHG emission estimates for construction. The proponent estimated the construction GHG emissions for Stage 4 of the revised proposal over a 30-month construction period to be: • scope 1: 108,154 tonnes of $CO_{2\text{-}e}$ • scope 2: no emissions • scope 3: 91,984 tonnes of $CO_{2\text{-}e}$ Operation Operational GHG emissions includes road users and maintenance of the road for all stages of the revised proposal. Operational GHG emissions over a 50-year life of the proposal was estimated to be: • scope 1: 69,435 tonnes of $CO_{2\text{-}e}$ • scope 2: no emissions • scope 3: 2,719,097 tonnes of $CO_{2\text{-}e}$.	No public or agency comments were received during the public review period.	Greenhouse gas emissions was not identified as a preliminary key environmental factor when the EPA set level of assessment. The Environmental Factor Guideline – Greenhouse Gas Emissions (EPA 2020b) details GHG emissions from a proposal will be assessed where it exceeds 100,000 tonnes of $CO_{2\text{-}e}$ each year for scope 1 emissions. The EPA notes that based on the expected duration of construction (30 months) and operations (50-years), the annual scope 1 emissions are approximately 43,262 tonnes of $CO_{2\text{-}e}$ for construction and 620 tonnes of $CO_{2\text{-}e}$ per during operations. Accordingly, based on the predicted scope 1 emissions of the proposal, the EPA did not consider greenhouse gas emissions to be a key environmental factor at the conclusion of its assessment.

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Government agency and public comments	Evaluation of why the factor is not a key environmental factor
Air quality	• Construction activities of the proposal have the potential to decrease air quality by increasing dust emissions, including from disturbance of asbestos, resulting in impacts to the construction work force. • Significant dust emissions can impact the amenity of nearby receptors. • Significant dust emissions can have indirect impact on flora and vegetation, and terrestrial fauna values.	No public or agency comments were received during the public review period.	Air quality was identified as a key environmental factor in the approved proposal and identified as a preliminary key environmental factor when the EPA set level of assessment for the proposal. The proposal is located within a semi-arid landscape that experiences natural dust levels that are known to exceed the National Environment Protection Measure for Ambient Air Quality (Air NEPM) criteria. Having regard to the: • separation distance between the development envelope and the nearest sensitive receptors being the Hamersley Homestead (1.2 km) and Coolawanyah Station (20 km) • management measures proposed by the proponent to manage dust during construction (see table 5-37 of Jacobs 2022a), including dust suppression and management of material transport and stockpiles • temporary nature of dust generating activities during construction • low risk of dust being generated during operation due to the road being fully sealed. it is likely that the proposal will be consistent with the EPA objective for air quality. Accordingly, the EPA did not consider air quality to be a key environmental factor at the conclusion of its assessment.
People			
Human health	• Inhalation of airborne asbestiform fibrous minerals presents a risk for human health.	No public or agency comments were received during the public review period.	Human health was not identified as a preliminary key environmental factor when the EPA set level of assessment.

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Government agency and public comments	Evaluation of why the factor is not a key environmental factor
			Historical asbestos from the rail line was cleaned up and removed as part of the construction of Stage 3 of the revised proposal, and no further clean-up of asbestos is required to construct Stage 4 of the revised proposal. A Preliminary Site Investigation identified that based on the geology of Stage 4 of the revised proposal, the area between Hamersley and Tom Price has a high risk of naturally occurring asbestos (NOA) (Jacobs 2021). Having regard to the: • proponent's commitment to undertake further investigations to assess potential for fibrous NOA during geotechnical investigations • development of an Asbestiform Materials and management plan for the approval of the Department of Mines, Industry Regulation and Safety, if required. NOA presents a risk to human health only if inhaled. The assessment of air quality concluded that the proposal is likely to be consistent with the EPA objective for air quality, therefore it is likely that the proposal will be consistent with the EPA objective for human health. Accordingly, the EPA did not consider human health to be a key environmental factor at the conclusion of its assessment.

Appendix E: Relevant policy, guidance and procedures

The EPA had particular regard to the policies, guidelines and procedures listed below in the assessment of the proposal.

- *Environmental factor guideline – Air quality* (EPA 2020a)
- *Environmental factor guideline – Flora and vegetation* (EPA 2016a)
- *Environmental factor guideline – Greenhouse gas emissions* (EPA 2020b)
- *Environmental factor guideline – Human health* (EPA 2016b)
- *Environmental factor guideline – Inland waters* (EPA 2018)
- *Environmental factor guideline – Social surroundings* (EPA 2016c)
- *Environmental factor guideline – Terrestrial fauna* (EPA 2016d)
- *Environmental impact assessment (Part IV Divisions 1 and 2) procedures manual* (EPA 2021a)
- *WA Environmental Offsets Policy* (Government of Western Australia 2011)
- *WA Environmental Offsets Guidelines* (Government of Western Australia 2014)
- *Statement of environmental principles, factors, objectives and aims of EIA* (EPA 2021b)
- *Environmental impact assessment (Part IV Divisions 1 and 2) administrative procedures 2021* (State of Western Australia 2021)
- *Technical guidance – Flora and vegetation surveys for environmental impact assessment* (EPA 2016e)
- *Technical guidance – Sampling of short-range endemic invertebrate fauna* (EPA 2016f)
- *Technical guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment* (EPA 2020c).

Appendix F: List of submitters

7-day comment on referral

Organisations and public

- Two organisations

Government agencies

- No comments received from government agencies.

Public review of proponent information

No comments were received from the public or government agencies during the public review period.

Appendix G: Assessment timeline

Date	Progress stages	Time (weeks)
16 December 2020	EPA decided to assess – level of assessment set	
7 January 2021	EPA requested additional information	3
28 October 2021	EPA received additional information	42
28 July 2022	EPA accepted additional information	39
8 August 2022	EPA released additional information for public review	2
5 September 2022	Public review period for additional information closed	4
6 February 2023	EPA accepted proponent's Response to Submissions and received final information for assessment	22
16 February 2023	EPA completed its assessment	2
29 March 2023	EPA provided report to the Minister for Environment	6
3 April 2023	EPA report published	3 days
24 April 2023	Appeals period closed	3

Timelines for an assessment may vary according to the complexity of the proposal and are usually agreed with the proponent soon after the EPA decides to assess the proposal and records the level of assessment.

In this case, the EPA met its timeline objective to complete its assessment and provide a report to the Minister.

Appendix H: Contemporising of Ministerial Statement 677

Ministerial condition	Environmental factor	Proposed change	Assessment and evaluation of proposed changes: will the change ensure the combined proposal (existing proposal with significant amendment) can be implemented consistently with the EPA objectives?
Condition 1 Implement the proposal in accordance with schedule 1.	N/A	Delete condition and replace with consolidated contemporary style condition.	Recommended condition A1 and introduction. EPA recommends condition 1 is replaced with a new condition setting the maximum limits on proposal characteristics which will ensure the implementation of the proposal is consistent with the EPA's objectives. This condition reflects contemporary conditions setting approach recommended by the EPA.
Condition 2 Implement the environmental management commitments in schedule 2.	N/A	Delete condition.	Condition 2 relates to environmental management commitments attached to MS 677. The EPA has reviewed each proponent commitment and considers that they fall into two categories: • duplicate requirements addressed by the proposed implementation conditions B2 to B7 as proposed to be amended (commitments 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 and 17) • have been fully implemented (commitments 1, 14, 15 and 16).
Condition 3 Proponent nomination and contact details.	N/A	Delete condition and replace with consolidated contemporary style condition.	Recommended condition D3. The requirements of this condition are still relevant and will be retained consistent with contemporary condition setting approach recommended by the EPA.
Condition 4 Commencement and time limit of approval.	N/A	Delete condition and replace with consolidated	Recommended condition D4.

Ministerial condition	Environmental factor	Proposed change	Assessment and evaluation of proposed changes: will the change ensure the combined proposal (existing proposal with significant amendment) can be implemented consistently with the EPA objectives?
		contemporary style condition.	The requirements of this condition are still relevant and will be retained consistent with the contemporary condition setting approach recommended by the EPA.
Condition 5 Compliance audit and performance review.	N/A	Delete condition and replace with consolidated contemporary style conditions.	Recommended conditions D1 and D2. The requirements of this condition are still relevant and will be retained consistent with contemporary condition setting approach recommended by the EPA.
Condition 6 Weed control.	Flora and vegetation	Delete condition and replace with consolidated contemporary style conditions.	Recommended conditions B2-1(4), B2-2, B2-4 and B7. Weed control is still a relevant consideration for the significant amendment. For stage 4, condition B2-1(4) provides an outcome for no adverse impacts to significant vegetation communities (which includes weeds). Condition B2-2 requires an EMP to monitor achievement of this outcome. Stage 2 and stage 3 have been constructed but post construction requirements are still required, including the management plan referred to in this condition of MS 677. Condition B7 requires the weed management plan for stage 3 to continue to be implemented until otherwise advised by the CEO. Condition B2-4 requires the ongoing control and management of weeds (kapok and ruby dock) within 50 m of the proposal through Millstream-Chichester National Park (relevant to stages 2 and 3 only).
Condition 7 Vegetation protection and rehabilitation.	Flora and vegetation	Delete condition and replace with consolidated contemporary style conditions.	Recommended conditions B2-1(3), B2-1(4), B2-2, B2-3 and B7. Themeda grasslands TEC was not disturbed in the original proposal but will be disturbed during stage 4 and is therefore

Ministerial condition	Environmental factor	Proposed change	Assessment and evaluation of proposed changes: will the change ensure the combined proposal (existing proposal with significant amendment) can be implemented consistently with the EPA objectives?
			still a relevant consideration. New conditions (B2-1(3) to B2-1(4)) provide outcomes to ensure limits on clearing, ensuring no temporary clearing or adverse impacts. Condition B2-2 requires an EMP to monitor achievement of these outcomes. Offset condition (B6) is also recommended to counterbalance the significant residual impact to the TEC. Rehabilitation/revegetation of areas is still a relevant consideration for the significant amendment. Condition B2-3 requires all temporary cleared areas not required for operations to be revegetated to a vegetation condition that is 'Good' or better. The EPA notes that the proponent has a signed an agreement with DBCA to provide funds for rehabilitation for broad conservation management works associated with protecting biodiversity values in Millstream-Chichester National Park in order to meet certain conditions in Ministerial Statement 677. The EPA expects the proponent will fulfill the obligations of that agreement and include evidence of progress/status of fulfilling this agreement in annual compliance reports. For the original proposal, Stage 2 compliance status is complete. Stage 3 is constructed but post construction requirements are still required, including the management plan referred to in this condition. Condition B7 requires the previous vegetation protection and rehabilitation management plans to continue to be implemented until otherwise advised by the CEO.

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