GOVERNMENT OF WESTERN AUSTRALIA

Department of **Biodiversity, Conservation and Attractions**

Nomination

Current conservation status				
Name of ecological community:	Depot Springs stygofauna community			
Other names:				
Description:	The community is known from the Depot Springs groundwater calcrete in Sandstone. It comprises an assemblage of stygofaunal (groundwater) species not known from anywhere else. The calcretes that support the community include those around Friday Well and Puncture Well (southern) and in the area of the shearing shed on Depot Springs Station (northern). Species restricted to this community include Dytiscidae (water beetles), *Limbodessus fridaywellensis* and *Paroster hinzeae*. The dytiscid (water beetle) species are known only from the Depot Springs calcrete, and the latter species only from Friday Well and belong to a different tribe of invertebrates (Hydroporini). Other fauna from Friday Well itself include Ostracoda (aquatic crustaceans: *Ryocypris* n. sp., *Plesiocypridopsis* n. sp., *Candonopsis* n. sp. 1), Cyclopoida (small custaceans: *Halicyclops* n. sp. 2, *Apocyclops* n. sp. 1, *Metacyclops* n. sp. 1) and Harpacticoida (New genus sp. 1 (Canthocamptidae)).			
Nomination for:	Listing under BC Act ☒	Change of status ☐	Delisting ☐	

1. *Is the ecological community currently on any conservation list, either in a State or Territory, Australia or Internationally?* 2. *Is it present in an Australian jurisdiction, but not listed?*	*Provide details of the occurrence and listing status for each jurisdiction in the following table*

Jurisdiction	**List or Act name**	**Date listed or assessed (or N/A)**	**Listing category eg. critically endangered (or none)**	**Listing criteria eg. B1ab(iii)+2ab(iii) (or none)**
National	EPBC Act			
Western Australia	TEC list: WA Minister ESA list in policy	21/09/2001	Vulnerable	B)
	Priority list		1 ☐ 2 ☐ 3 ☐ 4 ☐	
Other State/Territory				

Nominated conservation status: category and criteria (include recommended status for deleted ecological communities)

Critically endangered (CR) ☐ Endangered (EN) ☐ Vulnerable (VU) ☒ Collapsed (CO) ☐

Priority 1 ☐ Priority 2 ☐ Priority 3 ☐ Priority 4 ☐ None ☐

What criteria support the conservation status category for listing as a threatened ecological community or collapsed ecological community? *Refer to Section 32 of the Biodiversity Act 2016 for definition of 'Collapsed', and Appendix 3 table 'IUCN Red List Criteria for ecosystems version 2.2'.*		B3
Eligibility against the criteria		
*Provide justification for the nominated conservation status; is the ecological community eligible or ineligible for listing against the five criteria. For **delisting**, provide details for why the ecological community no longer meets the requirements of the current conservation status.*		
A.	Reduction in geographic distribution *(evidence of decline)*	☐ **A1** ☐ **A2a** ☐ **A2b** ☐ **A3**
	Justification of assessment under Criterion A.	For criteria A and B, the ecosystem was assumed to collapse when the mapped distribution declines to zero. • There are no available data to support an inference that a ≥30% reduction at least in geographic distribution has or will occur over any 50-year period, or a ≥50% reduction since ~1750 (ie. the minimum requirements to meet the category VU under criterion A). • **Community is data deficient under criterion A.**
B.	Restricted geographic distribution *(EOO and AOO, number of locations and evidence of decline)*	☐ **B1** (specify at least one of the following): ☐ **a)(i)** ☐ **a)(ii)** ☐ **a)(iii)** ☐ **b)** ☐ **c);** ☐ **B2** (specify at least one of the following): ☐ **a)(i)** ☐ **a)(ii)** ☐ **a)(iii)** ☐ **b)** ☐ **c);** ☒ **B3 (only for Vulnerable Listing)**
	Justification of assessment under Criterion B.	• B1: EOO is 129km^2 (≤2,000km^2, which is the threshold for CR). • B2: AOO is four 10x10 km grid cells (threshold for EN is 20, and for CR is two grid cells). Community meets threshold for rank EN under criterion part B2. • a): No data available to indicate a measure of decline in spatial extent, environmental quality or disruption to biotic interactions to support ranking under B1a or B2a. • b): Decline observed from the potential impacts of exploration drilling; and inferred from future changes to the hydrological regime associated with groundwater abstraction likely to cause continuing decline in the stygofaunal community in the next 20 years (see Appendix 1 for further information on threats). • c): Ecosystem exists at one threat-defined location (threshold for CR is one and for EN is 5 threat-defined locations).

		• B3: Known from one location that is prone to effects of human activities (hydrological change) or stochastic events within a very short time period in an uncertain future and thus capable of collapse or becoming CR within a very short time period (meets VU as ≤5 threat defined locations). **Meets VU under B3.** • Plausibly meets criteria for Critically Endangered under B1b,c, and Endangered under B2b,c. Most plausible rank is Vulnerable under B3 due to the lack of evidence to support inference of significant threat from hydrological change, or other source. • **VU is under B3 is most plausible.**
C.	Environmental degradation of abiotic variable *(Evidence of decline over 50-year period)*	☐ **C1** ☐ **C2** ☐ **C3**
	Justification of assessment under Criterion C.	• Hydrological change from groundwater abstraction or dewatering is an abiotic variable that is inferred to be a threat to the community. • The collapse state is considered to be a level of hydrological change (groundwater levels including aquifer thickness, or quality) that result in total loss of faunae that are crucial to the food web of the community. • For criterion C, the assessment of decline in abiotic processes is based on hydrological change. The stygofauna are hosted in shallow (<10m below ground level) alluvial aquifers and their habitat is maintained by saturation of these aquifers. The community is at risk from the changes to groundwater quality and levels associated with abstraction. • A drilling program to proceed mining was proposed within the community in the late 2000s. Drilling and mining have potential to impact on groundwater quality and levels through leakage and mixing. These changes have potential to affect the stygofauna that rely on very specific hydrological ecological niches and conditions for survival. The drilling proposal was withdrawn and the project was not implemented. • Based on recent remote sensing imagery there is no evidence of large scale vegetation clearing that may be indicative of mining within the mapped boundaries of the community. • Determining hydrological risk is problematic due to the complexity of the underlying aquifers, and difficulty of obtaining relevant data linking groundwater levels and quality, faunal composition, resilience and persistence. • It is not possible to determine a collapse point at which groundwater levels or quality will result in total loss of faunae that are crucial to the food web of the Depot Springs groundwater assemblage due to lack of data linking groundwater levels, aquifer thickness, water quality, and the status of the assemblage.

		• Based on the lack of evidence of large scale clearing generally associated with mining, it is unlikely that significant areas within the mapped boundary of the community have been impacted by mining and associated groundwater drawdown. • There is no evidence to indicate that the community meets the thresholds for minimum proportion of the extent (≥30%) or proportional severity of degradation (≥30%) over any 50-year period or (≥50% extent and severity since 1750) to meet VU under these criteria. • **Community does not meet Criterion C**
D.	Disruption of biotic processes or interactions *(Evidence of decline over 50-year period)*	☐ **D1** ☐ **D2** ☐ **D3**
	Justification of assessment under Criterion D.	• There are no data that suggest a biotic variable that may represent a threat to the community. • There are no available data to determine a suitable biotic variable on which to base assessment of criterion D, and therefore to determine if the community meets the minimum proportion of the extent (30%) or proportional severity of disruption of biotic processes (30%) over any 50-year period, or since 1750 (50% disruption of biotic processes / 50% of the extent) to meet VU. • **Community is data deficient under criterion D.**
E.	Quantitative analysis *(statistical probability of ecosystem collapse)*	• No quantitative estimates of the risk of ecosystem collapse. • **Unable to assess**

Reasons for change of status

Genuine change ☐ New knowledge ☐ Previous mistake ☐ Review/Other ☒

Provide details: The community was initially ranked Vulnerable using ranking criteria developed in WA that differ to those in the IUCN Red List Criteria for Ecosystems (version 2.2).

Summary of assessment information *(provide detailed information in the relevant sections of the nomination form)*

EOO	129km^2	AOO	Four 10x10 km grid cells (actual measured AOO ~37km^2)
No. occurrences	1	Severely fragmented	Yes ☐ No ☒ Unknown ☐
Justification	Known from a single mapped occurrence.		
Current known area			~4,495ha
Pre-industrialisation extent or its former known extent (if known)			~4,495ha

Estimated percentage decline	No available data suggest the community has declined in extent

Summary assessment against IUCN RLE Criteria

Criterion	Rank indicated	Overall conclusion
A1	-	• No evidence to indicate that community meets criterion
A2a	-	• No evidence to indicate that community meets criterion
A2b	-	• No evidence to indicate that community meets criterion
A3	-	• No evidence to indicate that community meets criterion
B1a	-	• No data available that indicate a measure of decline in spatial extent, environmental quality or disruption to biotic interactions. • Does not meet criterion
B1b	CR	• EOO is ≤2,000km^2 • Potential impacts from changes to the hydrological regime • CR is plausible • Does not meet criterion as no data available indicate threat is significant
B1c	CR	• EOO is ≤2,000km^2 • Ecosystem exists at one threat-defined location • CR is plausible • Does not meet criterion as no data available indicate level of threat is significant
B2a	-	• No appropriate data that indicate a measure decline in spatial extent, environmental quality or disruption to biotic interactions. • Does not meet criterion
B2b	EN	• AOO is four grid cells • Potential impacts from changes to the hydrological regime • EN is plausible • Does not meet criterion as no data available indicate level of threat is significant
B2c	EN	• AOO is four grid cells • Ecosystem exists at one threat-defined location • EN is plausible • Does not meet criterion as no data available indicate level of threat is significant
B3	VU	• Known from one location • Prone to the effects of human activities (hydrological change) or stochastic events within a short time period in an uncertain future • Meets criterion for VU
C1	-	• No evidence to indicate that the community meets the minimum thresholds for proportion of the extent (≥30%) or proportional severity of degradation (≥30%) over past 50 years to meet VU.
C2	-	• No evidence to indicate that the community meets the minimum thresholds for proportion of the extent (≥30%) or proportional severity of degradation (≥30%) over any 50-year period to meet VU.
C3	-	• No evidence to indicate that the community meets the minimum thresholds for proportion of the extent (≥50%) or proportional severity of disruption of abiotic processes (≥50%) since ~1750 to meet VU.
D1	-	• No available data to indicate a significant biotic threat to the community. No evidence to indicate that the community meets the minimum thresholds for proportion of the extent (≥30%) or proportional severity of degradation (≥30%) over any 50-year period to meet VU.
D2	-	• No evidence to indicate that the community meets the minimum thresholds for proportion of the extent (≥30%) or proportional severity of degradation (≥30%) over any 50-year period to meet VU.
D3	-	• No evidence to indicate that the community meets the minimum thresholds for proportion of the extent (≥50%) or proportional severity of disruption of biotic processes (≥50%) since ~1750 to meet VU.
E	NA	• No quantitative estimates of the risk of ecosystem collapse.
		Plausibly meets criteria for CR under B1b,c, EN under B2b,c and Vulnerable under B3. Rank VU B3 considered most plausible as community is prone to effects of human activities (hydrological change) or stochastic events within a very short time-period in an uncertain future. **Meets VU under B3**

Department of **Biodiversity**

Summary of location (occurrence) information *(provide detailed information in the relevant sections of the nomination form)*						
Occurrence	Land tenure	Survey information: date of survey	Condition	Area of occurrence (ha)	Threats *(note if past, present or future)*	Specific management actions
Depo01, Depo02, Depo03	Crown lease (Department of Planning, Lands and Heritage)	2000	Unknown	4,495	Hydrological changes (*past, present, future*)	

APPENDIX 1 THREATS

Hydrological changes

The stygofauna of Depot Springs are hosted in palaeochannel aquifers that are coupled with the superficial (shallow) calcrete aquifers. These are less than 5m below ground and commonly brackish to saline (between 2,000 and 6,000 mg/L Total Dissolved Solids). The community's habitat is maintained by saturation of these aquifers (Johnson *et al*. 1999). This poses challenging management issues as the aquifer constitutes the principal water supply for human activities, such as mineral exploration and dewatering associated with mining in the arid zone (Watts and Humphreys 2001). The main potential threatening processes to groundwater calcrete assemblages include operations that can lower the water table below ecologically appropriate levels. Surface operations (sealing or clearing), and below ground actions (water abstraction, and mine dewatering or recharge) have potential to impact the community (Humphries 2001).

A proposal was received in 2009 to undertake a program of works (PoW) to complete an aircore drilling program located approximately 220km NNE of Kalgoorlie. The PoW proposed drilling of 48 holes to test for uranium mineralisation in and below the calcrete layer (Aura EXP24626). All the proposed drilling areas extended over the full extent of the groundwater calcrete that provides habitat for the community. Drilling and mining have potential to impact on both the groundwater quality and levels through leakage and mixing, and hence to impact the stygofauna that are likely to rely on very specific hydrological ecological niches and conditions for survival. The drilling proposal was withdrawn and the project was not implemented (pers comm. [redacted][1]).

Based on recent remote sensing imagery there is no evidence of large-scale vegetation clearing that may be indicative of mining within the mapped boundaries of the community. The area is heavily drilled however. Pipes carrying water to service Kalgoorlie are also common near Depot Springs.

References

Aura Energy Limited (2009) Application documents for a Programme of Work – Exploration for proposed Aircore Drilling Program E36/557.

Humphries, W.F. (2001) Groundwater calcrete aquifers in the Australian arid zone: the context to an unfolding plethora of stygal biodiversity. *Records of the Western Australian Museum* Supplement No. 64: 63–83.

Johnson, S.L., Commander, D.P. and O'Boy, C.A. (1999) Groundwater Resources of the Northern Goldfields, Western Australia: Water and Rivers Commission, Hydrogeological Record Series, Report HG 2, 57p.

Watts, C.H.S. and Humphreys, W.F. (1999) Three new genera and five new species of Dytiscidae (Coleoptera) from underground waters in South Australia. *Records of the South Australian Museum* 32(2): 121–142.

[1] Conservation Officer Development Management – Goldfields Region

APPENDIX 2 Depot Springs stygofauna community (blue)

APPENDIX 3 IUCN Red List Criteria for ecosystems (version 2.2) (IUCN 2017)

A. Reduction in geographic distribution over ANY of the following time periods:

		CR	EN	VU
A1	Present (over the past 50 years).	≥ 80%	≥ 50%	≥ 30%
A2a	Future (over the next 50 years).	≥ 80%	≥ 50%	≥ 30%
A2b	Future (over any 50 year period including the present and future).	≥ 80%	≥ 50%	≥ 30%
A3	Historic (since 1750).	≥ 90%	≥ 70%	≥ 50%

B. Restricted geographic distribution indicated by EITHER B1, B2 or B3:

		CR	EN	VU
B1	Extent of a minimum convex polygon enclosing all occurrences (Extent of Occurrence)	≤ 2,000 km^2	≤ 20,000 km^2	≤ 50,000 km^2
	AND at least one of the following (a-c):			
	(a) An observed or inferred continuing decline in **EITHER**:			
	i. a measure of spatial extent appropriate to the ecosystem; **OR**			
	ii. a measure of environmental quality appropriate to characteristic biota of the ecosystem; **OR**			
	iii. a measure of disruption to biotic interactions appropriate to the characteristic biota of the ecosystem.			
	(b) Observed or inferred threatening processes that are likely to cause continuing declines in geographic distribution, environmental quality or biotic interactions within the next 20 years.			
	(c) Ecosystem exists at …	1 location	≤ 5 locations	≤ 10 locations
B2	The number of 10 × 10 km grid cells occupied (Area of Occupancy)	≤ 2	≤ 20	≤ 50
	AND at least one of a-c above (same sub-criteria as for B1).			
B3	A very small number of locations (generally fewer than 5) **AND** prone to the effects of human activities or stochastic events within a very short time period in an uncertain future, and thus capable of collapse or becoming Critically Endangered within a very short time period (B3 can only lead to a listing as VU).			VU

C. Environmental degradation over ANY of the following time periods:

C1 The past 50 years based on change in an abiotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:

Extent (%)	Relative severity (%) ≥ 80	≥ 50	≥ 30
≥ 80	CR	EN	VU
≥ 50	EN	VU	
≥ 30	VU		

C2 The next 50 years, or any 50-year period including the present and future, based on change in an abiotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:

Extent (%)	≥ 80	≥ 50	≥ 30
≥ 80	CR	EN	VU
≥ 50	EN	VU	
≥ 30	VU		

C3 Since 1750 based on change in an abiotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:

Extent (%)	≥ 90	≥ 70	≥ 50
≥ 90	CR	EN	VU
≥ 70	EN	VU	
≥ 50	VU		

D. Disruption of biotic processes or interactions over ANY of the following time periods:

D1 The past 50 years based on change in a biotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:

Extent (%)	Relative severity (%) ≥ 80	≥ 50	≥ 30
≥ 80	CR	EN	VU
≥ 50	EN	VU	
≥ 30	VU		

D2	(D2a) The next 50 years, or (D2b) any 50-year period including the present and future, based on change in a biotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table: OR		≥ 80	≥ 50	≥ 30
		≥ 80	CR	EN	VU
		≥ 50	EN	VU	
		≥ 30	VU		
D3	Since 1750, based on a change in a biotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:		≥ 90	≥ 70	≥ 50
		≥ 90	CR	EN	VU
		≥ 70	EN	VU	
		≥ 50	VU		
E. Quantitative analysis					
			CR	EN	VU
… that estimates the probability of ecosystem collapse to be:			≥ 50% within 50 years	≥ 20% within 50 years	≥ 10% within 100 years