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To Whom it May Concern,

**Submission on Draft Environmental Assessment Guideline (EAG) Consideration of Subterranean Fauna in Environmental Impact Assessment in WA**

The Environmental Consultants Association (WA) Inc. wishes to thank the EPA for the opportunity to comment Environmental Assessment Guideline (EAG) Consideration of Subterranean Fauna in Environmental Impact Assessment in WA

The following submission has been compiled by the Associations Management Committee and submitted on behalf of its membership.

Kind regards

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Committee Member  
ECA (WA) Inc.

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# Submission on Draft Environmental Assessment Guideline (EAG) Consideration of Subterranean Fauna in Environmental Impact Assessment in WA

## Summary

### General

The guidance provides far more flexibility while still requiring adequate survey effort, and allows for desktop assessment to eliminate subterranean fauna as an issue straight up if no habitat is present. Overall I think this is a good balance for an assessment guideline.

### Lack of prescriptive guidance or reference to prescriptive guidance

There is concern about lack of reference to the prescriptive guidance here, or even acknowledgement that prescriptive guidance exists and that this EAG should be read in conjunction with such guidance. This risk is that we end up in a similar situation to GS20 and terrestrial SRE surveys where the lack of prescriptive guidance (e.g. on survey effort) is resulting in highly variable surveys in terms of effort, methods and quality.

Overall, the EAG reads as advice about the process to follow when undertaking subterranean fauna assessment rather than the methods to use. We acknowledge this was intended but ignores the fact that it is the methods to be used and sampling effort decisions (the latter partly addressed in the EAG's Figure 2) that cause most problem. Regulators and consultants would both benefit from clear guidance about methods and effort, as would proponents trying to do the right thing.

The decision not to provide guidance about what constitutes appropriate field sampling methods and effort is puzzling. Consultants are in a difficult position, especially when competitive-tendering, when it comes to implementing adequate survey and the assessment process would be much better if proponents, regulators and consultants could all see the same quantitative guidance and the pressure for short-cutting was reduced.

### Issues with surrogates

There is mixed support for the use of surrogates and concern regarding the potential for mis-application. There clearly needs to be additional guidance on when it is appropriate to use surrogates and work is required in this area to build a scientifically sound framework for application of surrogates.

### Expertise

There is concern over the focus on who did the assessment work – assessment according to who you are rather than the conservation issues in the report – but it does highlight the widespread recognition that there is plenty of unevenness amongst consultants in terms of competence and ethics.

The best solution is accreditation and this should be the EPA's goal. In the interim, perhaps naming is the way to go. We encourage the EPA, DEC and WAM to collaborate in an annual training course/workshop where practitioners are trained and evaluated as a form of accreditation. Given the dynamic state of knowledge within this discipline, refreshers may need to be conducted also.

### WAM lodgement

There is support for WAM lodgement but some concern regarding enforcement of this requirement and risk of delays in the assessment process due to this requirement.

## Section 1.1 Purpose

- The document fails to clarify whether Guidance statement 54a is still valid as a whole or whether parts of this document supersede sections in 54a. It would be beneficial to reference 54a where sections are unchanged and where this draft updates requirements (e.g. prescriptive survey effort) stated in 54A.
- As the EAG specifies that it supersedes GS54 (paragraph 2 of section 1.1), and GS54a is described as a 'technical appendix' to GS54, it could be assumed that 54a is also redundant.
- Recognising that GS54a will be updated at some point in the future, we recommend referring to relevant prescriptive sampling guidance but in a way that accommodates future revisions to this guidance, e.g. either via link to EPA website for current guidance (with some instruction on which EPA guidance documents are current for subterranean fauna) or refer to 'GS54a and subsequent iterations' directly in the EAG (e.g. at section 1.5 end of paragraph 1).

## Section 1.2 Subterranean fauna

- The definition on what is stygofauna and troglofauna has been tightened up and improved since the last document. However, this needs to follow through in relation to taxonomic groups. Taxonomic names have been generalised and do not represent true obligate subterranean invertebrates. They need to be less general, i.e. bugs, worms, mites, springtails, myriapods, and split into troglofauna and stygofauna groups.
- Paragraph 2 – 'soil-dwelling fauna and burrowing fauna are excluded as subterranean fauna for the purpose of the EAG'. This is a problem since it is a fine line separating soil-dwelling fauna and troglofauna, and one that is not explained in this document. Even within this document (section 1.2, paragraph 4) the inconsistency between subterranean fauna and soil fauna is evident; mites and worms are listed as subterranean fauna, but these are often considered to be 'soil-dwelling' and 'burrowing' creatures, respectively.

This is a moot point however, since several soil-dwelling fauna groups have already been shown (unpublished unfortunately) to have the potential for local endemism: palpigrades, pauropods and symphylans. They are likely SREs, but they are not sampled for in conventional SRE surveys. The only options for evaluating these fauna are through subterranean fauna surveys.

We recommend removing the segregation of soil-dwelling fauna and burrowing fauna from subterranean fauna and for each species sampled to be assessed in accordance with the survey and, or taxonomic/genetic data.

- Paragraph 3 – 'As a consequence subterranean fauna are generally highly specialised'; recommend replacing 'generally' with 'often'.
- Paragraph 4 – 'Examples of invertebrate groups in WA include...'; revise to 'Examples of invertebrate groups with subterranean representatives in WA include...'
  - Arachnida; pseudoscorpions (Pseudoscorpiones), spiders (Araneae), Schizomida, and scorpions (Scorpiones)
  - Myriapoda; centipedes (Scolopendramorpha, Geophilomorpha, Pauropoda); millipedes (Polydesmida, Polyxenida, Spirobolida, Polyzoniida)

- Insecta; cockroaches (Nocticolidae and Blattidae), silverfish (Thysanura), sucking bugs (Reduviidae and Fulgoroidea), diplurans (Diplura), beetles (Coleoptera)
- Crustacea; pill bugs or slaters (Isopoda)
- Paragraph 4 – The list of subterranean groups excludes Diplurans, which are commonly captured in subterranean surveys and are strong SRE candidates. It also includes crickets and thrips (Thysanura) which occur very rarely as troglobites. Recommend including Diplurans and removing crickets and thrips as the latter two are very atypical troglofauna.

### **Section 1.3 EPA’s objective for the environmental factor of subterranean fauna**

- It would be helpful if the key terms – representation, diversity, viability and ecological function – in the revised objective for subterranean fauna were explained in the EAG, as they relate to subterranean fauna, and how they are to be assessed during impact assessments (section 3.3.2) for subterranean fauna. For example, what does ‘representation’ mean for subterranean fauna?
- Also how exactly can surrogates shed light on diversity, viability and ecological function. Sound ecological and environmental data are required to assess/understand these qualities. The use of surrogates may be counter intuitive for the inference of ecological function, since surrogates would logically be competitive and therefore more likely to exclude each other from the same habitats.

### **Section 1.4 Rationale**

- Paragraph 3 – the use of surrogates can only ‘provide additional evidence’ if there is statistical support indicating that this is ‘real evidence’. Caution against use of the term ‘evidence’ in this context as it carries significant meaning scientifically. Recommend revising to ‘..the EPA recognises that the use of surrogates (...), when applied appropriately, may assist interpretations in some cases’. Clear guidance on circumstances where use of surrogates is ‘appropriate’ needs to be provided.
- Paragraph 3 – wording implies surrogates can be used as a standard technique, without any apparent scientific guidance or rigour. There is no published evidence to demonstrate this approach could even work. Cautions need to be applied where reference is made to the use of surrogates in the document.

### **Figure 1**

- The knowledge/evidence table is clear and will be helpful for proponents.

### **Section 1.5 Role of this EAG**

- ‘This EAG does not provide prescriptive advice on sampling or analysis techniques’ - this statement is left hanging. There should be a closing statement indicating where the prescriptive advice can be found, if not directly cited (GS54a?).

## Section 2.1 Background

- Paragraph 1 – ‘...many of which...’ suggest replace ‘many’ with ‘most’.

## Section 2.3 History of assessment

- Paragraph 2 – this is the only section which refers to guidance statement 54a in the entire document. There needs to be greater reference to it or reproduction of relevant parts if they are superseded.

## Section 3.1 Level 1 survey

- Desktop study – a desktop study is not considered a ‘survey’. Use of the word ‘survey’ can be confusing and creates ambiguity, in particular in Table 2 (see Table 2 below regarding ‘No survey required’). We suggest changing the levels to ‘Level 1 assessment’ and ‘Level 2 assessment’.
- Reconnaissance survey – similarly with regard to the ‘reconnaissance’, in our view ‘pilot’ would be more fitting as there is no clear way to tell if subterranean fauna exist just from looking at the surface. A reconnaissance trip would be a waste of time and resources if low level sampling was not included. We realise that the EPA is attempting to bring terminology into line with flora and fauna guidelines; however, it should not be standardised to the extent that the terminology no longer relates meaningfully to the guideline/subject matter.

## Figure 2

- As per comments in Section 3.1, ‘reconnaissance’ is pointless for subfauna without any sampling. Recommend revising diagram to exclude ‘reconnaissance. At the first stage, options should be either ‘desktop only’ or ‘desktop plus low intensity sampling’.
- At the stage of the desktop study, it is unlikely that subterranean fauna habitat will have been ‘found’. Therefore, where the desktop study results indicate ‘subterranean fauna habitat found’ and ‘subterranean fauna habitat not found’, suggest the wording is revised to ‘subterranean fauna habitat likely to be present’ and ‘subterranean fauna habitat unlikely to be present’.
- Figure 2 is a very useful framework for decision-making regarding the requirements for subterranean surveys. However, there should also be some quantitative definitions provided for the major steps in the flow chart – consider this for the revision to GS54a.

## Section 3.2 Level 2 survey

- Paragraph 1 – ‘A Level 2 survey may range from targeted to comprehensive’ – there is no gradient here so replace with ‘...survey may be either comprehensive or targeted’.
- Comprehensive – comprehensive survey requirements should be either stated clearly in this section or should refer to relevant sections within 54a guidelines e.g. what does repeated sampling mean here – to cover seasonal variability?, min. number of sampling rounds? Focus on repetition but no mention of adequate sample size.

- Comprehensive – ‘...to allow an understanding of the fauna values of an area...’ – suggest refining wording to ‘...understanding of the subterranean faunal values of an area...’
- Targeted – limited/insufficient? What level is considered insufficient?

### **Section 3.3 Determining survey level**

- ‘The level and amount of survey’ – what does amount mean? Not a very scientific term, suggest revising to ‘The survey level and effort undertaken...’.
- How does Level 1 determine whether further surveys are required? What outcomes dictate further survey. Figure 2 decision tree explains at a very high level, e.g. ‘subterranean fauna habitat found’ in desktop study triggers requirement for L2 survey. Low intensity sampling yielding sub fauna also triggers requirement for full survey.

### **Table 1**

- The wording within this table needs consistency. For example ‘calcrete’ is mentioned under the stygofauna section whereas ‘groundwater calcrete formations above water table’ has been used for troglifauna.
- Are ‘alluvial formations (particularly when associated with alluvial or palaeochannel aquifers)’ not always associated with alluvial aquifers?
- In regard to water quality it would be inaccurate to state there is low chance of stygofauna within salinities higher than marine concentrations (35,000 mg/L). This contradicts guideline 54a which states they can be found in water over 60,000 mg/L. In addition, recent work has shown some stygofauna to occur in salinities exceeding 100,000 mg/L.
- There is also no reference to guideline 54a nor clarification on other important water quality factors i.e. pH, DO, etc.

### **Section 3.3.1 Determining presence of subterranean fauna habitat**

- Paragraph 3 – as per comments in Section 3.1, suggest you don’t refer to the level 1 desktop study as a survey. So revise this paragraph to ‘...Level 1 desktop study, as this helps to determine whether a survey is required’.
- Also suggest that paragraph 3 should be the first para. in this section.
- Again, it would be helpful to cross reference here to where guidance is available on sampling effort required for each survey level.
- No mention of where guidance methodology here. Reference to 54a OR other EPA web site guidance needs to be provided.

### **Section 3.3.2 Identifying impacts and their likely significance**

- Paragraph 4, first sentence – ‘For example, the degree of impact is likely to be low where the project impact is only above ground’ – surely this statement refers to stygofauna only- ‘..the degree of impact to stygofauna...’.

- Also on the above point, does ‘project impact’ in statement only refer to direct removal of habitat? How do indirect impacts fit in here? A mining above water table project may still impact underlying stygofauna habitat through contamination – degree of risk obviously depends on the type of project. So we caution against including a blanket assessment of ‘low impact’ to stygofauna if ‘project impact’ is only above ground, at this stage, without at least acknowledging that indirect impacts must be considered also.
- Paragraph 4, last two sentences – these double up and contradict each other somewhat – impact to trogs from resource extraction ‘high’ or ‘moderate to high’. Excavation of rock/resource can also impact stygofauna if below water table.
- The description of the impacts and levels of significance is not realistic. Surely the impact is relevant to the population involved (i.e. size and geographic extent); even a small disturbance can have very significant impacts if they target highly localised populations.
- A better approach might be to measure the impact relevant to the population or habitat extent, e.g.:
  - 85-100% loss: catastrophic impact; population will most likely be lost
  - 50-85% loss: high impact
  - 30%-50% loss: moderate impact
  - <30% loss: low impact
- Assessment of impacts may also need to take into account habitat fragmentation if only small pockets of habitat are proposed to remain

### Section 3.3.3 Appropriate level of survey

- Three levels of survey are identified: Level 1, Level 2 comprehensive and targeted Level 2. The targeted Level 2 survey type is not explained in either GS54a or GS56. This survey needs to be explained in more detail.
- Paragraph 3 – ‘desktop study’ not ‘desktop survey’. And ‘no surveys are warranted’ not ‘no further surveys...’. Suggest all occurrences in the document are revised.
- Paragraph 3 – as per Section 3.1 and Fig 2 comments, a reconnaissance survey is pointless for subterranean fauna. Should go straight from desktop study to low intensity sampling (i.e. pilot).
- How will the EPA gage the suitability of survey intensity?

### Table 2

In the matrix where there is ‘low’ likely degree of impacts and ‘low’ likelihood of habitat supporting SF, ‘No survey required’ is stated. In the strict context of the Table it comes across that no desktop would be required. However, in the context of the supporting text, it becomes apparent that ‘No survey required’ relates to no reconnaissance or low level sampling required. The potential for misinterpretation should be removed altogether which relates to comments made above in Section 3.1.

Given the categorical nature of the decision tree in Figure 2, Table 1 would be more useful if it were categorical rather than probabilistic.

This table needs details: what are the thresholds between low/medium/high degrees of impact?

Only Low or High degrees of impact are noted. What is the action for medium impact?

### **Section 4.1 Sampling**

- This section really needs to provide a link to the prescriptive guidance on survey intensity and methods; at least indicate that prescriptive guidance exists and should be referred to.
- Paragraph 4 – ‘Adequacy of sampling should be determined on a case-by-case basis.’ How? If consultants are to act on this then they need clear guidance. Please provide more details. The comparison of species richness against extrapolated species richness is probably the best way to assess survey adequacy. There are limitations to this approach, for instance some sampling methods (troglofauna traps) appear to selectively sample a small diversity of invertebrates and 60 troglofauna trap samples would probably sample everything that the traps are likely to capture. The same number of bore scrapes are however likely to reveal a much richer fauna. It is for this reason that both methods need to be used to assess the complementarity of the results for troglofauna surveys.
- Section 4.1 suggests the amount of sampling should be based on existing information, site characteristics and likely impact. Consideration of likely impact should certainly affect (1) whether to investigate stygofauna at what level of survey and (2) the amount and type of sampling. But sampling effort expectations should also reflect what capture efficiencies of subterranean fauna are likely to be and there is a strong case for also requiring an evaluation of sampling results in terms of whether the expected proportion of the fauna was collected.
- The survey levels outlined in 54a are clearly inadequate using the prescribed intensity of that document. We have repeatedly demonstrated that even with 2X minimum intensity of GS45a, the proportion of the extrapolated species richness recovered is always below 95% for troglofauna. .
- Subterranean fauna communities can be quite diverse in their richness and population densities. This is critically important as without some kind of survey intensity gage, how will the EPA determine if a survey yielded sufficient data to enable EIA.
- Paragraph 2 – ‘Surveys should be coordinated and led by specialists who have had training and experience in subterranean fauna survey and identification of subterranean fauna.’ How will the EPA judge this? What qualifies as ‘experience’. Please see comments in ‘General comments’ regarding the need for accreditation/formal training of subterranean fauna practitioners.

### **Section 4.2 Use of genetics**

- The use of genetics is supported but the likelihood of actually demonstrating current gene flow is low in many subterranean situations where undoubtedly the same species occur in two nearby areas. Thus, genetics is likely to be more useful if used in a complementary way to morphology to determine whether the two areas contain the same species (essentially the barcoding approach mentioned in the EAG).



## Section 4.3 Use of surrogates

- The explicit use of surrogates is good as this is a common argument in many assessments of impact to subterranean fauna where many species are inherently rare, and also difficult to collect. However, there needs to be more detailed guidance on when use of surrogates can be used.
- There is concern regarding use of surrogates when inferring species distribution. This approach could open the door to false interpretations of species distribution and subsequent approvals.
- Based on the current level of detail in the EAG, it is difficult to imagine how the EPA's objective for subterranean fauna to 'maintain representation, diversity, viability and ecological function at the species, population and assemblage level', can be confidently achieved using surrogates.
- The use of surrogates needs to be explained in detail, including methods of data sampling and analyses. At what point does the EPA consider there to be sufficient evidence to support the application of surrogates? There has to be some criteria/thresholds to provide consistent guidance for consultants and regulators regarding which and when surrogates are appropriate. Otherwise there is a serious risk of mis-application of surrogates which could lead to inaccurate interpretations of species distributions and conservation value and therefore inaccurate assessment of impacts to species.
- The EAG should also include guidance on experimental design that includes the collection of physical variables and the use of multivariate statistics to test the hypothesis, i.e. whether surrogate is appropriate.
- The use of abundant species to infer the likely ranges of rare species is appealing and is supported but it must recognize ecological reality. Abundant species tend to have larger ranges than rare species and, therefore, only other rare species should be used as surrogates for range information. Unfortunately, these do not often have multiple occurrences, which limits the reliance on surrogates and stresses the importance of sampling campaigns targeting 'restricted' species and also the value of various kinds of community level analysis.
- If a rare species (A) is used as a surrogate for another rare species (B) it must meet some minimum criteria. The following may be appropriate but note that there is little scientific literature as a basis for these and work is required to test and develop appropriate criteria based on scientific studies:
  - both species must have been recorded from the same location/bore
  - at least similar size class, i.e. 'A' must not be smaller than 'B'
  - same level of subterranean specialisation
  - similar mobility patterns.
- Paragraph 6 – 'Data from surrogates can be used to conclude whether species are likely to be found both within and outside the footprint area'. Suggest replacing 'conclude' with 'infer'. Conclude suggests a final decision where use of surrogates is completely hypothetical

## Section 5

- The section on specimen vouchering and lodgement is supported.
- The Museum does not have a consultant's sense of commitment to meeting a proponent's timeline and this is seen as likely to lead to considerable delays in the assessment process for many proponents. Use of Museum code names requires that the Museum turns around identifications/confirmations within the timeframe expected of assessment (perhaps one week at the outside?). Is this possible or will the EAG significantly slow the assessment process with this requirement?
- How will this be enforced? Recommend that assessments are not looked at until a list of specimens can be provided with supporting WAM registration numbers.
- All of the sequence data should be made publically available. This can be facilitated using Genbank or BOLD systems. Genbank is a well-supported repository for DNA sequences and is used by most peer review journals for the reference to published DNA sequences and their analyses.
- Currently, DNA sequences submitted to the WAM are not made publically available and until this is changed we do not consider the WAM an appropriate sole repository for these data. DNA sequences submitted to Genbank are open to anyone with a computer, including the WAM and DEC. All sequences submitted to Genbank receive a registration code and these can be submitted in consultants reports to support their analyses.
- WAMinals should be implemented fully to assist the processes of identification and use of Museum codes.

## Section 6 Interpretation and reporting

- Paragraph 6 –'The likely proportion of species detected by the survey should be discussed and comparison of sites should show all taxa present. If the survey resulted in unusually low diversity in an area where high diversity was expected, results should be explained, including consideration of adequacy of survey effort'

This suggests the use of diversity extrapolation and species accumulation analyses. This needs to be more clearly explained and discussed. The 'likely proportion of species detected' needs to be defined. Currently that proportion is set to 95% in GS45a (page 19) but is not being adhered to consistently. There also doesn't appear to be any enforcement by regulators when the 95% is not reached.

Note also that a high proportion of the species richness of troglofauna is usually made up of singletons and doubletons. It is therefore also important that the proportion of species detected should be greater 95% in order to have confidence about the use of surrogates.