WILDFLOWER SOCIETY OF WESTERN AUSTRALIA (Inc)

4 May 2021

The Chairman
Environmental Protection Authority
Locked Bag 10
Joondalup DC WA 6919

Re: Audalia Medcalf Vanadium Project, Assessment Number 2156

Introduction

The Wildflower Society of Western Australia (WSWA) has analysed the Public Environmental Review documents for the Audalia Medcalf Vanadium Project (Assessment Number 2156) and in this submission we focus on the deficiencies, inadequacies and oversights of the project. We do acknowledge the degree of planning and detail provided by the proponent. However, as presented, the project has serious shortcomings that must, at a minimum, call for redesign and additional preparatory surveys, if not rejection of the proposal.

We identify issues with a lack of impact minimisation, poor specification of haul road design, poorly designed rehabilitation that will leave environmental values irreparably diminished, potentially severe impacts on fauna (resulting in possibly extinction of troglofauna species), inadequacy of offsets, deficiencies in monitoring, and a total lack of accountability of greenhouse gas emissions. We detail these issues below, principally referring to the Environmental Review Document (ERD), Document ID AUD-MED-ERD-01; other documents are referred to via their Appendix number and title.

Lack of Minimisation

The first lack of minimisation in the proposal is that mining the resource using an underground mine instead of an open-cut pit was never considered (page 21 and 22 of ERD). This alternative would greatly alleviate the impact on terrestrial flora and fauna. The amount of ore mined would be reduced and the mining time frame would be expanded; however, it would remiss of the EPA not to insist for an analysis of this mitigation option.

The second main lack of minimisation is the unnecessarily large haul road disturbance footprint and development envelope (DE). All documentation indicates that up to, and likely very close to, 350 ha of the haul road DE will be cleared, e.g. page 17 of the ERD states that the haul road "requires an average disturbance width of approximately 40 m" with a running surface of 11 m wide. When averaged over the 74 km of the haul road, a 40-m wide disturbance amounts to 296 ha. The full haul road DE is 1,633 ha (page 5, ERD). In addition, turnout drains (which appear to be factored in every 100 m) would add extra clearing. Indeed, indicative figures, such as Figure ES3, include turnout drains that extend beyond the 40 m disturbance footprint (within a full DE of over 200 m wide).

Consideration was given to developing a haul road, which would be about 1/3 of the distance of the route proposed, south to intersect with the Lake King-Norseman Road. This option would require use of a road which has controlled access associated with weather conditions. However, the option did not consider the lesser comparative impact of the clearing of vegetation for a shorter route and its associated environmental benefit. The transport route option preferred was selected purely on economic and operational grounds without the inclusion of environmental effects in that assessment.

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The ERD documentation and appendices provides road design cross sections, but from what is supplied it is clear that 40 m is anticipated to be cleared for the road maintenance zone. This clearing width of 40 m is excessive. A road with an 11m running surface can be accommodated within a 20m clearing width. The landscape is stated, and mapped, as being relatively flat. In other flat landscapes, such as that near Koolyanobbing and Mt Jackson, the haul road - which also has a running surface of 11 m - has a total clearing width of approximately 23 m. That is not to say than 23 m is the minimum amount required; in our opinion a clearing of less than 23 m would be adequate: e.g. 11 m running surface plus 3.5 m either side for table drains and batters, which do not need to be wide and extensive due to the flat landscape and low rainfall in the area. If, instead, an 18 m clearing were used then the total clearing required would be approximately 140 ha (133 ha for the haul road and 7 ha for the turnout drains). This would represent a reduction in clearing of some 200 ha of native vegetation. Note that the WSWA does not object to a large DE for the haul road provided that the total to be cleared is a much smaller area (e.g. 140 ha disturbance footprint).

Haul Road

As stated above, there are no design details provided for the haul road, only an indicative route and typical cross-sections. Aside from the excessive amount of clearing required for the road, what is presented in the ERD does reveal some avoidable potential issues on flora and surface water.

One Priority 3 taxon, *Acacia mutabilis* subsp. *stipulifera*, may be impacted by the haul road (Fig. 70, page 178 of ERD). A reduction in the clearing width of the haul road, along with sensible routing of the road may result in avoiding impact on this taxon in most instances.

One of the most restricted of the vegetation communities in the project and surrounding area is the granite outcrops and surrounding heath vegetation communities (Vegetation code G-H1 of Appendix 3.9, page 45). Although the impact on this community is projected to be 5.3% of the mapped extent (page 242, ERD), the impact would be greatly reduced if the haul road clearing width were reduced, along with sensible routing of the road to avoid this community.

Floodways are planned to maintain surface water flows over many of the identified water crossings (Table 72, ERD). In the Description part of Table 72, where floodways are not proposed, the reason given is "No structure may be viable, but may need road maintenance after rainfall events". Given that a floodway is a sealed section of the road, which also allows the passage of the surface water from one side to the other, we cannot understand (nor agree) why it would not be possible to construct floodways at all identified crossings. Given that the EPA object of ecological integrity is to maintain "the composition, structure, function and processes of ecosystems, and the natural range of variation of these elements" (page xxi, ERD), floodways should be installed at all of these crossings to maintain these small, but nonetheless important water flows, especially as the haul road may not be removed upon mine closure (i.e. be a permanent feature).

The documentation provided by Audalia does not provide design, construction and decommissioning details for the haul road. Two highly relevant questions cannot be answered by the information provided: 1) where will the material for the road surface come from? 2) If the road is to be rehabilitated, what will happen to the road surface material (which will likely be contaminated with saline water and hydrocarbons)?

Dust from the haul road will be suppressed by usage of groundwater at a rate of 0.4 GL/yr. Chemicals may also be used: "Regular application of water or ideally a chemical suppressant on unpaved haul roads" (page 23, Appendix 10). Groundwater with salinity of up to 10,000 mg/L TDS will be targeted for use in dust suppression, although the exact salinity of the water to be used is not known (page 345, ERD). The running surface will also receive hydrocarbon depositions from the vehicles. Therefore, over time, the running surface will likely accumulate salt and other chemicals that may be deleterious to the vegetation if left in the area should rehabilitation occur. That is, a plan for its testing and removal should have been included.

Audalia has undertaken to rehabilitate the road if need be: "The haul road will either be retained with a new owner agreed to take responsibility, or will be rehabilitated with any watercourse crossing structures removed" (page xxvi, ERD). Details of the rehabilitation, including the removal of the material (if necessary), as well as targets and monitoring are not supplied. They should be.

Mine Closure Plan and Rehabilitation

The MCP does not clearly described the current knowledge gaps in information required to deliver a detailed MCP from the conceptual design provided. It has also based domains on structure types, rather than describing domains as the manner in which the structures in a specific location are integrated to deliver an overall closure outcome.

The MCP lacks sufficient modelling of structure designs to provide any confidence that the structures will be stable from a physical, chemical, or biological standpoint. There are sufficient tools available to allow such models to be developed and measurement to be taken to determine if the structures are performing as modelled. The baseline data should have included a series of landform analysis to establish the relationship between landform structure, physical features, biological composition and soil chemistry to establish if the structure designs proposed exist within the landscape and if they support the species and habitat proposed to cover those structures post-closure.

No consideration has been given to the option of backfilling open cut pits with waste material in development of the mining sequence to minimise the development of waste rock dumps and tailings storage facilities to limit the closure liabilities.

With respect to the EPA's environmental objective "to protect flora and vegetation so that biological diversity and ecological integrity are maintained", page xxi of the ERD states that: "In the context of this objective: "ecological integrity" is listed as the composition, structure, function and processes of ecosystems, and the natural range of variation of these elements". The mine closure, revegetation and rehabilitations plan fail in this respect. Below we detail the shortcomings and potential remedies.

Section 9.2.1 of the Mine Closure Plan (MCP; Appendix 4) states that "The mine pits will be retained as voids, with further potentially economic ore located deeper than the current mine plan". This is totally unacceptable, unnecessary and is contrary the objective of *ecological integrity*. Adequately rehabilitated (see comments below), a soil layer on top of the mined pits would be of the order of 1-2 m thick. Such a layer could be easily, and somewhat trivially, removed if mining of the unspecified ore body were to commence at some unspecified point in the future. In the meantime, full revegetation of the pits - which are above the water table, and hence would not be flooded - would restore the vegetation communities lost in the mining process.

The mine and associated infrastructure will impact several priority flora, as well as the threatened *Marianthus aquilonaris*. Two of the priority taxa, *Eucalyptus rhomboidea* and *Stenanthemum bremerense*, are given special consideration with respect to impacts, and germination trials and rehabilitation, because it is probable that these taxa may have their conservation status upgraded to Threatened. However, three other priority flora will also be impacted by the proposal (page 69, ERD): *Acacia mutabilis* subsp. *stipulifera* (P3), *Hakea pendens* (P3) and *Teucrium diabolicum*. Not only are the germination and likely rehabilitation success not considered for most of these priority species, critically, some of these species are key components of the vegetation communities to be impacted. This is especially the case for *H. pendens*, which occurs most abundantly in the areas to be mined (Fig. 24, ERD) and will have approximately 60% of its occurrence in the local area eliminated (page xx, ERD). These priority species need to be given special attention in the rehabilitation plan and completion criteria.

The MCP does not consider the prior/undisturbed vegetation communities with respect to revegetation. For adequate rehabilitation to occur, these prior communities should be replicated post-mining. The vegetation communities have been mapped, and these prior species compositions and densities should be used as the benchmark for rehabilitation of specific areas. For example, the mine pit areas should be rehabilitated with *H. pendens* as a dominant component.

The MCP and rehabilitation plan has several other inadequacies. The MCP states that "Topsoil will generally be reapplied at a thickness of 0.1 m, with the exception of 0.15 m on the TSF top surface and embankments, and EP footprint" (page 129, Appendix 4). Table 2 of Appendix 2 gives "typical" examples of rooting depths for different soil types. *Hakea pendens*, for example, grows mainly on the deeper soils in the mine envelope, far deeper than 0.1 m. Pertinently, however, direct observation of soil and rooting depths should be made when the top layer of material is dug up, to inform the required depth of soil needed to be laid down for rehabilitation.

The MCP for the Tailing Storage Facility (TSF) and Evaporation Ponds, assumes that a topsoil layer of 0.1 m (or 0.15 m) on top of a "rock armour" layer will be sufficient for the growth and maintenance of the rehabilitated plant communities. This is almost certainly inadequate and will not result in a replication of the pre-existing communities. At least 1-2 m of sub-surface soil will likely be required for adequate rehabilitation. Sufficient depth in the TSF will exist for a deeper rehabilitation soil layer: the distance from the projected topsoil surface to the top of the crest bund is estimated to be about 1.75 m (Fig 16, Appendix 7.6). The source material for the sub-surface soil would be the overburden soil from those same areas to be disturbed, i.e. a stockpile of sub-surface soil would need to be created in addition to topsoil.

The rehabilitation plan for the TSF assumes that large rainfall events will create a pond on the surface (page 16, Appendix 7.6). There is no consideration for how that will affect the rehabilitated vegetation. A superior design, mentioned above, would be to have a thicker soil layer, which would soak up the rain and provide rooting depth and longevity of soil moisture for the plants.

Rehabilitation targets and monitoring for the rehabilitation are either vague or set a low bar (Table 32, Appendix 4). A completion criterion is established: "Revegetated areas are well established and represent a self-sustaining vegetation community (based on at least two seasons of seed production) and are similar to the surrounding environment in terms of floral compositions at analogue sites (>50%

species richness, >50% stems cover/density) and <10% weed cover.". This criterion has two issues: 1) the species richness percentage is inadequately low; 2) as stated above, the prior communities are not referenced, only the surrounding environment is used as a reference. This would result in some vegetation communities, such as the *H. pendens*-dominated community being extirpated from the landscape permanently. Given the relatively low species richness in many of the communities (especially for perennial species), a target of 100% species occurrence is achievable. As stated above, the rehabilitation should attempt to replicate all prior vegetation communities, not simply replicate those surrounding communities that remain after mining.

As mentioned in the section on the Haul Road, the MCP does not consider the rehabilitation of the haul road, even though its rehabilitation is a possible requirement after mine closure.

Impacts on Native Fauna

In contrary to expectations, many undescribed troglofauna species were found in the mine development envelope. Critically, six of those species were only found from the proposed mine pits (page 267, ERD). Because of this, page xxiv of the ERD states that:

"Audalia has commissioned a third round of troglofauna surveys to verify that troglofauna habitat and populations are not constrained to the mine pits, TSF or evaporation ponds. Once this position is verified then Audalia considers that the EPA's environmental objective for this factor can be met, as the excavation or indirect impact of a relatively small portion of the available habitat would be unlikely to threaten the maintenance of biological diversity and ecological integrity. This information will be provided to the Department of Water and Environmental Regulation (DWER) as soon as it is available (expected September / October 2020), and prior to their assessment."

No details of this assessment are given in the Public Environmental Review documents. In the absence of this information, the Precautionary Principle must be applied, and it must be (conservatively) assumed that those six troglofauna species are to be found only in the proposed mine pits and quite possibly nowhere else. Thus, unless other information clearly demonstrates the contrary, it must be assumed that the mining of those areas could cause the extinction of those six species.

The EPA must assert that all surveys for these troglofauna species conclusively show that their distributions are secure outside the proposed mine pits. The impacts on these species also should be appropriately offset (see below).

Offsets

The proposed offsets for residual environmental impact have shortcomings for three groups: flora species, ecological communities, and short-range endemic fauna species (troglofauna).

As mentioned in the section above, impacts to only three of the conservation-significant flora taxa - *M. aquilonaris*, *E. rhomboidea* and *S. bremerense* - are considered as being significant. Impacts to three other priority flora - *Acacia mutabilis* subsp. *stipulifera* (P3), *Hakea pendens* (P3) and *Teucrium diabolicum* - are not considered (Table 75, ERD). We consider that the mitigation reasoning given in Table 76 (ERD) for these species is inadequate, for reasons stated above in the "Mine Closure Plan and Rehabilitation" section. *H. pendens* has been demonstrated to have high germinability (page 108, ERD), however, it is not a key feature in the rehabilitation plan, despite the fact the the bulk of its populations occur in the proposed mine pit areas. Nothing in particular is considered for the other two

species and, as stated above, the rehabilitation plan has critical failings. In addition, the haul road may never be rehabilitated so the impact on species occurring there should be offset as a precaution (i.e. it should be assumed that there remains a residual impact). In summary, if impacts to these species leave a residual impact, then those impacts must be offset, but this is not proposed.

For reasons stated above in the "Mine Closure Plan and Rehabilitation" section, we consider that the MCP and rehabilitation plan will fail to deliver ecological communities matching those prior to mining. Thus we reject the "Likely Rehab Success" statements given in Table 76 (ERD) for the "Bremer Range Vegetation Complexes PEC" and "Locally significant vegetation". If the rehabilitation plan were strongly modified (e.g. including rehabilitation of the mine pits, deeper soil profiles, high species richness/composition completion criteria) then the assessments of Table 76 would have some merit. As it stands, however, the proposal will leave significant residual impacts; these must be offset, but no offsets are proposed.

The potential impact on the troglofauna species (outlined above) will not necessarily be mitigated if the proponent can "Verify that troglofauna species and habitats are not restricted to the mine pits, TSF or Evaporation Ponds" (Table 76, ERD). Population size and range estimates are needed and, fundamentally, the impact needs to be demonstrated to be insignificant. That it is stated that there will be no residual impact so long as they are discovered elsewhere falls well short of the Precautionary Principle. For example, if all of these species are discovered in a single test hole outside the planned mining area how can one be sure that that is not the sole, last vestige of their habitat; it not only needs to be demonstrated that it is not, but it also needs to be demonstrated that the impact on their populations is not significant.

Monitoring and Modelling

As part of the MCP, it is stated that to monitor vegetation rehabilitation success "The location and number of monitoring sites will be determined by a suitably qualified professional prior to the completion of operations at the Project." (page 167, Appendix 4). As stated above, because the rehabilitation does not attempt to replicate all prior vegetation communities, such a strategy will, at best, result in communities similar to those surrounding communities that remain after mining, but will not replicate those that were present before mining took place. We strongly advocate amending this monitoring regime to also include comparison to prior vegetation communities.

With respect to the effects of dust, the dust modelling only considers the mine site and the start of haul road, not the haul road itself (p 141 and Fig. 55, ERD). Therefore, it is assumed that dust suppression on the haul road will be totally effective; however, this has not been demonstrated to be the case in the documentation supplied. There is sufficient evidence that long term use of haul roads for ore transport does influence the condition of vegetation downwind of the haul road.

Dust is proposed to be monitored at several locations (page 192, ERD) and the effects of dust at certain concentrations on vegetation are assumed based on other studies. Although this indirect measure of dust impact may be adequate, a better strategy would also include direct dust measurements, and physiological and health measurements on the plants themselves, in those communities most likely to be impacted, especially the *M. aquilonaris* community.

Greenhouse Gas Emissions

The project will generate a considerable amount of greenhouse gas emissions, estimated to be "707.258 kt CO2-e across the project life" (page 7, Appendix 9,). There is no stated mitigation of these greenhouse gases by renewable sources, except to state that "Solar panels may be used in conjunction with diesel generators to provide power where appropriate." (page 19, ERD,). The use of renewable energy sources could account for some of these emissions, with the remainder being offset by carbon offsets through a carbon market or otherwise (e.g. private revegetation projects). As it stands, however, the broader-scale impacts of these carbon emissions (contribution to global warming) are not accounted for.

Summary

The proposed project has several critical issues requiring amendments to the proposal or rejection if that is not possible. These issues include:

- Lack of impact minimisation: underground mining was never considered.
- Lack of impact minimisation: the haul road disturbance envelope is overly expansive and could be more than halved and options for less disturbance are not considered.
- Poor specification of haul road design: prior and post material impacts are not detailed; maintenance of all surface water flows may not occur
- Lack of consideration of rehabilitating the mine pits: this can and should be done.
- Poorly designed vegetation rehabilitation that will leave environmental values irreparably diminished: inadequate proposed soil thicknesses on the TSF and EPs; lack of replication of prior vegetation communities; low completion criteria.
- Potentially severe impacts on troglofauna, possibly resulting in extinction of six species.
- Inadequate consideration of offsets for flora and vegetation communities, and short-range endemic fauna.
- Shortcomings in dust and vegetation rehabilitation monitoring
- Lack of accountability of greenhouse gas emissions.

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