



Our ref: DOC19/899609

Senders ref: SSI 9687

Marcus Ray
Deputy Secretary
Planning and Assessment
Department of Planning Industry and Environment
GPO Box 39
SYDNEY NSW 2001

Dear Mr Ray *Marcus*

Subject: Snowy 2.0 Main Works Environmental Impact Assessment – EES Submission

I refer to your department's email dated 16 September 2019 seeking comment on the Snowy 2.0 Main Works project located in Kosciuszko National Park (KNP), within the Snowy Valleys and Snowy Monaro local government areas. As requested, the Environment, Energy and Science Group (EES) of the Department of Planning, Industry and Environment (DPIE) has reviewed the exhibited Environmental Impact Statement (EIS) and supporting technical reports.

The Snowy 2.0 Project was granted Critical State Significant Infrastructure status in March 2018, thereby making the Minister for Planning the consent authority, notwithstanding the project's presence largely within Kosciuszko National Park. In November 2018, the NSW Parliament also amended the *Snowy Hydro Corporatisation Act 1997* (NSW) to allow the granting of leases for the project. Under that legislation, these leases may only be granted once planning approval is in place.

I understand Snowy Hydro Limited and their consultants have consulted with the National Parks and Wildlife Service (NPWS), as the park management authority, and relevant areas of DPIE such as Biodiversity and Conservation Division (B&C) on the Main Works. Nevertheless, EES still has significant concerns regarding the proposal.

Our detailed advice is provided in **Attachments A and B**, however the critical issues for EES requiring clarification, continued discussion and resolution prior to final consideration of the proposal are:

- placement of spoil on land within Kosciuszko National Park is not supported. Appropriate compensation to NPWS would be necessary if this is approved
- the EIS does not clearly delineate and quantify all the areas that will be impacted. Instead it describes broad impact corridors and gives the impression that a far greater area will be impacted than will actually occur. Detailed designs therefore need to be provided which show how impacts on biodiversity have been avoided and what the residual impacts will be
- the provision of this information will allow accurate calculation of offset requirements in the Biodiversity Development Assessment Report (BDAR)
- Biodiversity Offset Strategy, including a Rehabilitation (or broader Restoration) Plan that outlines appropriate rehabilitation, offset funds to NPWS and mechanisms to manage potential long term liabilities such as stability and contamination



- recreational impacts, particularly related to the proposed closure of Tantangara Road (not supported by NPWS), and resulting alternatives and compensation
- NPWS road network impacts and long-term management arrangements
- unknown impacts due to groundwater drawdown
- potential liability for NPWS post construction in two circumstances, (i) rehabilitation does not meet completion criteria in agreed timeframe or is incapable of meeting the completion criteria and (ii) long term stability or contamination issues.

Separate advice will be provided on the assessment on the Commonwealth MNES matters as an accredited project under the NSW Bilateral agreement.

EES also holds significant concerns with regards to biosecurity and the potential for pests and viruses to spread to Tantangara Reservoir and beyond to the Murrumbidgee River. EES has not provided detailed comment on this issue, on the understanding that the Department of Primary Industries (Fisheries) will respond on behalf of agencies.

Similarly, EES notes surface water management and water quality issues are an ongoing concern. EES has not provided detailed comment on this issue, noting that the Environment Protection Authority will respond on behalf of agencies.

If you have any questions regarding this advice, please do not hesitate to contact Michael Saxon, Director South East on 02 6229 7107 for any Biodiversity and Conservation related matters, and Nicole Shotter, Manager Snowy 2.0, NPWS on 02 6450 5535 for any other matters.

Yours sincerely

Anissa Levy

**Coordinator-General
Environment, Energy and Science**

ATTACHMENT A – Assessment Summary for Snowy 2.0 Main Works (SSI 9687)

ATTACHMENT B - Detailed BDAR review against BAM requirements

ATTACHMENT A: Assessment Summary for Snowy 2.0 Main Works (SSI 9687)

Acronym	Definition
BAM	Biodiversity Assessment Method
BC Act	Biodiversity Conservation Act 2016
B&C	Biodiversity and Conservation DPIE
BDAR	Biodiversity Development Assessment Report
CoA	Infrastructure Condition of Approval (if approved)
EEC	Endangered Ecological Community
EES	Energy Environment and Science Group
KNP	Kosciuszko National Park
MW EIS	Snowy 2.0 Main Works EIS Vol. 1
NPWS	National Parks and Wildlife Service
RTS	Response to Submission
SEAR	Secretaries Environmental Assessment Requirements
SHL	Snowy Hydro Limited
TARP	Trigger Action Response Plan
TEC	Threatened Ecological Community

Key Issues

1	General Requirements	<p>Issues:</p> <ol style="list-style-type: none"> SEARs require a full description of the project. The MW EIS Section 2.2.2 states “<i>that a detailed design process is now underway</i>”. MW EIS Section 2.2.3 identifies “<i>fish control structures in proximity to Tantangara Dam</i>”. MW EIS Figure 2.3 identifies that there will be permanent utilities in KNP. MW EIS Section 2.2.3 indicates further geotechnical investigations are to be undertaken. <p>Recommended action/conditions of approval (numbers directly link to Issues identified above – this is consistent throughout the table):</p> <ol style="list-style-type: none">
---	-----------------------------	---

		<ul style="list-style-type: none"> a) clarification be provided for all construction and operational features, through detailed descriptions, visual representations and figures. b) clarification be provided on the total area of new landforms by zone, including details of those areas that will not be able to be rehabilitated (e.g. areas with high slope angle such as Talbingo portal area and road batters), thus leaving a permanent impact. c) clarification be provided on disturbance areas shown in MW EIS Figure 2.9 on Nungar Creek Trail. These appear to show the installation of utilities deviating from the current track alignment. d) CoA requires all utility installation to occur along current road and track alignments. e) clarification be provided on the extent and methodology of upgrading Tantangara Creek Trail across Nungar Creek (refer MW EIS Figure 2.9). f) CoA requires the Essential Energy powerlines from Providence Portal to Tantangara Dam to be removed and the easement rehabilitated once a permanent underground power source is constructed from Lobs Hole to Tantangara. <p>2)</p> <ul style="list-style-type: none"> a) CoA requires ongoing monitoring program and TARP for Stocky Galaxias and Climbing Galaxias. b) CoA requires ongoing responsibility and maintenance of the fish control structures to be assigned to the proponent. <p>3)</p> <ul style="list-style-type: none"> a) clarification be provided on detail in Appendix N.2 Soils and Land Assessment Section 6.6 p.103, which indicates permanent communications cable routes between “Tantangara Intake to Lake Eucumbene and Lake Eucumbene to Cabramurra via Three Mile Dam”. There are no descriptions of these new permanent utilities or the proposed routes. b) CoA requires under-stream boring be used for installation of utilities for all stream order classifications, and that no current NPWS road infrastructure (e.g. culvert) is removed and replaced to install utilities. <p>4) clarification be provided on the extent of new geotechnical drilling investigations identified within the MW EIS, in comparison to the investigations already completed. Response to include details of any impacts required to previously rehabilitated trails and drill pads used during Feasibility Study.</p>
--	--	---

2	Biodiversity	Issues:
---	---------------------	----------------

		<p>1) The <i>BDAR Appendix M</i> has been reviewed against the SEARs for biodiversity.</p> <p>DPIE ESS acknowledge that EMM have undertaken a significant amount of biodiversity survey across the project area in consultation with agency staff. This work has resulted in significant additions to our knowledge of biodiversity values in the northern section of KNP. DPIE also acknowledge that this has influenced Snowy Hydro's design of certain project elements to avoid impacts to areas of high biodiversity value.</p> <p>Overall the BDAR by EMM provides a high-quality assessment of biodiversity values given the scope and demands of such a large-scale project, and project area. However, the following are considered key biodiversity issues that require further consideration to support the NSW BC Act requirements and avoid significant impacts to high risk biodiversity values in KNP. These issues were discussed at a site meeting on 17-18 October 2019 between representatives of NPWS, B&C, Snowy Hydro and EMM:</p> <ol style="list-style-type: none"> Significant Impact to Smoky Mouse (Critically endangered EPBC Act, Endangered BC Act): EMM have determined that the proposed impacts to >174ha of Smoky Mouse habitat will exceed the EPBC significant impact criteria for Smoky Mouse. EMM's assessment against the BC Act Serious and Irreversible Impact (SAII) assessment criteria also supports this conclusion. EES are of the understanding that direct impacts as assessed in the current BDAR are likely to reduce subject to review of a final detailed design (which may reduce the proposed disturbance areas). Review of final direct impact footprint may affect the impact assessment (Stage 2 BAM) and alter credit obligation: The BDAR assessment is not based on a final detailed design. It is acknowledged that the BDAR has compensated for this by assuming direct impacts to a full potential disturbance footprint, and that the final footprint is intended to have less direct impact on biodiversity values. Predicting uncertain impacts to highly sensitive groundwater dependent ecosystems and potential for further offsetting: As required by the BAM, EMM have identified a high but uncertain risk of indirect impacts to biodiversity values within groundwater dependant ecosystems including Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregion EEC. In a potential worst-case scenario of groundwater drawdown, a total area of 28ha of groundwater dependant ecosystems, including
--	--	--

		<p>approximately 17.5ha of Alpine Bogs and Fens, would be impacted. These impacts are well identified in the BDAR but, as the BAM allows, do not contribute to the current credit obligation. Snowy Hydro propose to minimise impacts to a large degree by pre-grouting the concrete tunnel in line with groundwater modelling guidelines and to mitigate residual risks by implementation of a monitoring program designed to ensure that post approval, actual impacts are within or less than predicted.</p> <p>Notwithstanding this, DPIE are concerned about the currently identified high level of risk and uncertainty regarding the residual level of impact. Without review of an adaptive management strategy to identify, measure and potentially offset this risk in accordance with BAM Section 9.4.2 and DPIE Upland Swamp Policy, any change to species composition as a result of drawdown impact could be considered as a total loss of the community.</p> <p>d. Gaps in mapping, survey and assessment data and revised credit obligation for Alpine She-oak Skink: Review of the BAM calculations in BOAMs and EMM spatial data shows some gaps in the survey data. EMM have acknowledged some of these gaps in the BDAR.</p> <p>e. Other improvements required for the BDAR: items that will need to be addressed upon finalisation of direct impact footprint and revision of calculator.</p> <p>Specific comments on the BDAR against BAM requirements and related sections in the EIS are included in Attachment B: Detailed BDAR review against BAM requirements.</p> <ol style="list-style-type: none"> 2) Appendix M.3 outlines Recreational Offset Strategies 3) MW EIS Section 2.3.1 identifies <i>“hazardous tree assessment of trees that are outside the disturbance boundary but within close proximity, and removal of any trees deemed to be hazardous or at-risk to ensure the safety of workers.”</i> 4) BDAR Baseline Stygofauna Study p. 3 recommendations 5) MW EIS p.6-52 identifies that in relation to 17.51 ha of TEC (Alpine Sphagnum Bogs and Fens) <i>“the scale and extent of these impacts are unknown and will be subject to ongoing monitoring.”</i> 6) MW EIS Table 6.6 and Appendix G Table G.1 addresses biodiversity mitigation measures 7) MW EIS Table 6.10 identifies impacts on aquatic habitat due to “The crossing site at Talbingo Reservoir”. 8) MW EIS Table 6.12 and Appendix M.2 Aquatic Ecology, identify Aquatic Ecology mitigation measures which require clarification
--	--	---

		<p>Recommended action/conditions of approval:</p> <p>1)</p> <ul style="list-style-type: none"> a. a revised project design that demonstrates a reduced impact to Smoky Mouse habitat would need to be provided prior to any commencement of works in Smoky Mouse habitat. A revised BDAR needs to provide a revised assessment of direct, indirect, prescribed and uncertain impacts on the species in accordance with BAM and EPBC assessment criteria b. once the final design is determined, DPIE is of the understanding that Snowy Hydro will seek to alter the credit obligation. Further consideration of direct, indirect, prescribed impacts and uncertain impacts will be required upon submission of final design and should inform a revised BDAR. c. for the bogs and fens EEC - the BDAR needs to detail an adaptive management strategy to measure and respond to these impacts, and to secure and deliver potential offsets in line with BAM S9.4.2 and DPIE upland swamp policy. The policy requires that offset liability is based on the maximum predicted groundwater drawdown. d. revised consideration of credit obligation for the Alpine She-oak Skink. The credit calculations should include all areas mapped as species polygons within PCT 1225 vegetation zones, as reflected by the spatial data provided and as required by BAM Section 11.2.4.2. This is supported by DPIE given the proximity of records to this PCT, and known records in this type of habitat in Nungar Plain and other locations in KNP (pers observations – M Schroder) e. a revised BDAR needs to include: <ul style="list-style-type: none"> ○ assessment of habitat suitability for threatened species as required by the NSW BAM Section 6.4, including revision of any candidate species, excluded from the current assessment without detailed justification against BAM requirements ○ undertaking additional plots in vegetation zones to meet the minimum BAM requirement ○ plot proximity to impact area ○ additional flora and fauna surveys in impact area to cover acknowledged gaps in survey data ○ results from the additional surveys and any additional BAM assessment requirements that might apply, including re-consideration of avoid and minimise, and any adjustments to
--	--	---

		<p>species credit species polygons, credit calculations and SAII considerations</p> <ul style="list-style-type: none"> ○ revised mapping must identify location and extent of TEC's and any other threatened species detected as a result of the additional surveys, including EEC Montane peatlands (BC Act), Alpine Bogs and Fens (EPBC Act) and, if determined to be present, CEEC Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion in the Rock Forest area (SAII) ○ further documentation on the justification why PCT 1225 has been excluded from the Bogs and Fens EPBC EEC listing in terms of potential impacts. <p>2) provide clarification (after consultation with NPWS) of a comprehensive Recreational Offset Strategy addressing impacts, mitigation measures and offsets to recreational use and facilities during construction and operation of the project.</p> <p>3) the CoA requires that the disturbance area includes all foreseen impacts, which are assessed in the BDAR.</p> <p>4) the CoA requires that the extent of the commitment to groundwater dependent ecosystems (GDE) and stygofauna outlined in the baseline study in the MW EIS (p. 26) and mitigation measure ECO3, <i>"developing a more detailed understanding of the connectivity of alpine bogs/fens and fractured rock aquifers to determine the likely risks to alpine bogs and fens and stygofauna as a result of impacts to aquifers associated with the Snowy 2.0 Project"</i> be described. This commitment should be across the construction phase and into operation and include mitigation measures.</p> <p>5) the CoA requires ongoing monitoring of Alpine Sphagnum Bogs and Fens and other PCT's that may be impacted by groundwater drawdown during construction and operation. If unavoidable impacts occur to biodiversity values, then an offset is provided at the time the impact is recognised.</p> <p>6)</p> <ul style="list-style-type: none"> a) clarification be provided on the extent of fencing identified in EC01 and EC04 and the assessment of impacts on other species and NPWS operations such as wildfire management. b) the CoA extend mitigation measures EC02/ECO6 (weed/pest control programs) to include all the disturbance footprint (not only the road verges) beyond construction to operations. c) the CoA requires the retention of logs and tree limbs for rehabilitation outlined in EC04. NPWS has raised this issue during Exploratory Works and it has been indicated that due to limited space, there are restrictions on the ability to store these materials for use in rehabilitation.
--	--	--

		<p>d) the CoA requires that the project use the rock material proposed to be excavated from the block stream during rehabilitation.</p> <p>e) the CoA restricts the collection of native seeds and alpine sod for propagation EC04, from within the identified disturbance footprint.</p> <p>7) clarification be provided as to the nature of the “crossing site at Talbingo Reservoir” as this infrastructure is not described or shown in any mapping.</p> <p>8) due to uncertainty relating to biosecurity risks, the CoA requires measures AE01, AE04, to be expanded to include the operation phase of the project for all identified pest and translocated native species and include appropriate TARP.</p>
--	--	---

3	Heritage	<p>Issues:</p> <ol style="list-style-type: none"> 1) MW EIS Table 6.22 (Plateau) identifies that not all the disturbance footprint has been surveyed. 2) MW EIS Table 6.23 HER03 identifies heritage mitigation measures 3) commitments outlined in correspondence from SHL to NPWS on the 15 June 2018 (DOC18/483690-3) relating to ‘terms of agreement for provision of compensation for predicted impacts on Kosciuszko National Park from the Snowy 2.0 Exploratory Works’ <p>Recommended action/conditions of approval:</p> <ol style="list-style-type: none"> 1) that the RTS provide assessment of heritage values for all disturbance areas. 2) that the CoA prohibits intended vegetation clearing within the boundary of the Ravine cemetery identified in HERO4. Vegetation clearing within the boundaries of the cemetery does not meet the conclusions and recommendations of Appendix P.2 Heritage Assessment p.607 which states, “<i>The boundaries of the Cemetery should be identified on the ground and the area should be marked as a no go zone so as to ensure that no inadvertent impacts occur in that area.</i>” 3) that the CoA requires uncovered moveable heritage items from both Exploratory Works and Main Works to be safely stored and incorporated into a display at the recreation area at Lobs Hole Ravine post construction of Snowy 2.0, with the aim to interpret and protect agricultural and mining artefacts. This action to be completed by the proponents cost and undertaking. A consultant should be engaged to develop and produce an interpretative heritage plan of the Lobs Hole Ravine area for incorporation into the display and that this be duplicated in the Tantangara area of the project.
---	-----------------	---

4	Water	<p>Issues:</p> <ol style="list-style-type: none"> 1) the SEARs require an assessment of the impacts on “<i>key water features on site, including potential impacts on riparian land and the Tantangara and Talbingo Reservoir; and a description of the likely changes to the hydrological regime of the existing water storages of the Snowy Hydro Scheme up to the authorised full supply level and any associated biodiversity impacts</i>”. 2) the EIS p.6-52 identifies that in relation to 17.51 ha of TEC (Alpine Sphagnum Bogs and Fens) “<i>the scale and extent of these impacts are unknown and will be subject to ongoing monitoring.</i>” This unknown scale and extent of impact may also impact an unnamed tributary of Gooandra Creek which is the only water source adjacent to Bullocks Hill campground in KNP. 3) the EIS Table 6.2 and Appendix G Table G.1 identify mitigation measures for water impacts. <p>Recommended action/conditions of approval:</p> <ol style="list-style-type: none"> 1) <ol style="list-style-type: none"> a) an assessment be made of the impacts and risks to riparian land along the Tantangara and Talbingo Reservoirs due to the changes in hydrological regime up to full supply level. b) the CoA requires mitigation measures to address increased wave erosion on reservoir edges and emplacement areas - to avoid or minimise associated water, land and biodiversity impacts. NPWS, B&C and DPI to be consulted in development of mitigation measures. 2) the CoA requires the Water Management Plan WM01 and Water Monitoring Program WM02 to identify ongoing monitoring of the unnamed tributary adjacent to Bullocks Hill camp ground and provide for mitigation or offset if groundwater drawdown impacts on the quality and or quantity of this recreational water source. 3) <ol style="list-style-type: none"> a) the Water Management Plan is prepared in consultation with NPWS, as well as the other identified agencies. b) the CoA requires the Water Monitoring Program WM02 be conducted during both construction and operational phases and include proposed mitigation and management measures for any developing or unforeseen impacts to surface water, groundwater and reservoirs.
---	--------------	---

5	Land	Issues:
---	-------------	----------------

		<ol style="list-style-type: none"> 1) the EIS proposes permanent on land and reservoir emplacement of spoil within KNP. 2) the EIS proposes the use of Tunnel Boring Machines for tunnelling. 3) the EIS Figure 2.5 indicates that final rehabilitation will be completed in 6 months. 4) the EIS and Appendix F Rehabilitation Strategy, indicates rehabilitated land will be returned to NPWS. 5) the EIS indicates retaining utilities for operations. 6) the EIS p. 6-79 identifies that Lobs Hole Ravine Road will have an indicative disturbance footprint of up to 80 m wide. 7) the EIS Table 6.14 and Appendix G Table G.1 identifies mitigation measures for land impacts. <p>Recommended action/conditions of approval:</p> <ol style="list-style-type: none"> 1) <ol style="list-style-type: none"> a) the CoA requires that the design, rehabilitation, long-term use, monitoring and maintenance liability of all disturbed areas in KNP is completed to the satisfaction of NPWS. b) if spoil emplacement in KNP is approved, that the CoA requires that as much uncontaminated suitable tunnel spoil as possible be reused by either the proponent or NPWS, both at the proponent's expense (crushed, screened, hauled, stockpiled and applied through gravel patching and re-sheeting) for upgrading of roads and trails within KNP to the satisfaction of NPWS. 2) that the CoA requires the Tunnel Boring Machines to be decommissioned and removed from KNP post construction. 3) clarification is provided on the level of rehabilitation expected to be completed within 6 months of completing construction program. 4) <ol style="list-style-type: none"> a) the CoA requires REHAB01 Appendix G, relating to the Rehabilitation Management Plan, to include all disturbance areas not only "<i>A Rehabilitation Management Plan will be prepared for the new landforms at Tantangara Reservoir, Lobs Hole and Talbingo Reservoir</i>" and that the plan be prepared to the satisfaction of NPWS. b) the CoA requires monitoring, maintenance and management (e.g. rehabilitation, stability, contamination) of all impacted areas to be the responsibility of the proponent and carried out to the satisfaction of NPWS. c) the CoA outlines clear bench marks/measures of success/completion criteria to the satisfaction of EES for rehabilitation (e.g. recognisable and demonstratable self-
--	--	--

		<p>sufficient PCTs) with provisions for monitoring and TARP by SHL for disturbance areas during operation.</p> <p>d) clarification is provided through final landform design drawings and cross sections for all disturbed area (e.g. Talbingo construction portal appears to be retained with significant cut and batters and not returned to a state “<i>commensurate with the surrounding topography of the area</i>” Appendix X p.32).</p> <p>e) the CoA requires that if an area is unable to be returned to a state “<i>commensurate with the surrounding topography</i>” then these areas are to be included within the operational footprint.</p> <p>5) the CoA requires all operational utilities be underground.</p> <p>6)</p> <p>a) EES preference is that the CoA does not allow further impact on the geodiversity features on Lobs Hole Ravine Road.</p> <p>b) if further impact is approved, the CoA should require the minimum footprint possible for Lobs Hole Ravine Road, with appropriate justification provided (eg design drawings, in particular the detail relating to exact extent of impacts to geodiversity features).</p> <p>c) the CoA requires the measures outlined in Appendix O.2 Cenozoic Geodiversity Assessment GEO4 p.63 to include all known Tufa deposits as already outlined and conditioned in Figure 4.6 of the Infrastructure Approval for Exploratory Works.</p> <p>d) the CoA place ongoing responsibility for maintaining stability of the block streams and Lobs Holes Ravine Road on the proponent.</p> <p>7)</p> <p>a) the CoA requires that GEO3 include key recommendations at Appendix O.1 p. 33-34, ‘<i>Ensure new cuttings are stable by ensuring a suitable angle and incorporate a stepped design. Avoid any use of shotcrete or vegetation seeding that would cover new exposures.</i>’.</p> <p>b) the CoA requires that GEO6 management plans include all recommendations in the Cenozoic and Palaeozoic Geodiversity reports, not only those that minimise impacts for known and potentially undocumented sites. Specifically, that parking and viewing areas at geodiversity features on Lobs Hole Road, rather than being ‘considered where practical’ (GOE03), are incorporated into road design, and are completed to the satisfaction of NPWS.</p>
--	--	--

6	Transport	Issues:
---	------------------	----------------

		<ol style="list-style-type: none"> 1) the EIS indicates Tantangara Road will be available to the public through facilitated access. 2) the EIS indicates permanent access roads and tracks. 3) the EIS Figure 2.23 indicates primary transport routes only 4) the EIS 6.9.1 describes the existing road network in KNP. 5) Appendix Q (Traffic and Transport) Section 4.2 identifies cumulative impacts. 6) Appendix Q Section 4.9 identifies OSOM critical constraints. 7) Appendix Q and G identify traffic mitigation measures. <p>Recommended action/conditions of approval:</p> <ol style="list-style-type: none"> 1) <ol style="list-style-type: none"> a) the CoA require that Tantangara Road remains open to the public once the 9-month upgrade is complete with facilitated access during the upgrade period. b) the CoA provide for NPWS to have operational access to all areas of KNP, at all times, to the satisfaction of NPWS. c) that NPWS will not be burdened with additional expenses, such as In Vehicle Monitoring Systems (IVMS), in order to move through the site to gain access to KNP for operational activities. If required, temporary IVMS units are to be provided by the proponent. 2) <ol style="list-style-type: none"> a) the CoA requires that the classification, long term use, rehabilitation and maintenance of all access within KNP (e.g. MW EIS Figure 2.26 shows a section of Lobs Hole Ravine Road north within the operational footprint of the tailrace, MW EIS Table 2.17 has some incorrect statements relating to long term access) be finalised to the satisfaction of NPWS. b) the CoA require the finalisation of a Roads Maintenance Agreement between NPWS and SHL prior to pre-construction. 3) <ol style="list-style-type: none"> a) clarification is provided with an assessment of all transport routes utilising NPWS managed roads/tracks and that they are subject to dilapidation surveys and rehabilitation CoA. b) clarification is provided on detail in Appendix Q section 3.2.4.5 relating to the use of Lobs Hole Ravine Road north as SHL has already amended its use to be more than for emergency access under Exploratory Works. c) that the CoA confirms that no financial impost will be placed on NPWS operations, such as snow clearing, as a result of increased traffic from the project. 4) <ol style="list-style-type: none"> a) clarification is provided as to why Elliot Way and Tantangara Road are not described within the existing KNP road network.
--	--	--

		<p>b) that the CoA requires that an '<i>Intersection warrants review according to Austroads (2017)</i>' assessment for the intersections within KNP in MW EIS Table 6.24 be completed as has been done in Table 6.25 for key intersections outside of KNP.</p> <p>c) recommend Link Road be included in the list of "Roads to be upgraded" MW EIS p.6-122.</p> <p>d) clarification is provided on details in MW EIS Table 6.26 and Appendix Q Table 4-1 as to the traffic volumes along the length of Link Road between Snowy Mountains Highway and Ravine Road. The table appears to indicate that there will be significant project LV and HV using Kings Cross Road. Why is this the case as it is assumed that all project HV and the majority of LV will be travelling from Snowy Mountains Highway into Ravine Road. To what extent will project traffic utilise Kings Cross Road?</p> <p>e) clarification is provided on Link Road "<i>suitable management measures</i>" indicated in MW EIS Table 6.27.</p> <p>f) the CoA requires that TRA04 MW EIS Table 6.31 include all KNP roads to be used for the project.</p> <p>g) that NAV01 MW EIS Table 6.31 and mitigation measures in Appendix W (Navigation) 5.4.4 include consultation with NPWS in relation to notification signage at Tantangara and Talbingo Reservoir access points, and measures to be implemented during operations.</p> <p>5) clarification is provided on why the cumulative impacts of the Transgrid Shallow Connection Project have not been considered in the assessment scenarios.</p> <p>6) recommendation CoA require a review of critical constraints of transporting OSOM for Link Road.</p> <p>7)</p> <p>a) the CoA requires that mitigation measures at the Snowy Mountains Highway / Tantangara Road intersection TRA02 include channelised turning lanes and loop detection electronic speed signalling for this intersection as outlined in the Road Safety Audit Appendix Q.</p> <p>b) the CoA requires that the recommendations for Link Road in the Road Safety Audit p.18 Appendix C of Appendix Q are implemented.</p> <p>c) the CoA requires mitigation measure TRA03 to include NPWS as a relevant road authority approving OSOM permits on Link Road.</p>
--	--	--

7	Amenity	Issues:
---	---------	---------

		<p>1) MW EIS Table 6.34 mitigation measures for amenity do not address noise impacts to NPWS campgrounds along the Snowy Mountains Highway (Rocky Plain campground) and Link Road (3 Mile Dam campground). MW EIS Section 6.10.6 identifies <i>"While noise levels are within NML's for identified recreational sites within KNP, they will be audible and may affect the amenity of recreational user experience."</i></p> <p>2) Appendix S (Landscape and Visual Impact Assessment) identifies items that require clarification.</p> <p>3) Appendix S p.90 identifies <i>"It is possible that the operation of the project may also lead to a deterioration of the condition of the Tantangara Reservoir shoreline due to the overall operating water level range of approximately 22 vertical metres with associated horizontal fluctuations of the shoreline of up to 50 metres"</i>.</p> <p>Recommended action/conditions of approval:</p> <p>1)</p> <ul style="list-style-type: none"> a) the CoA requires the provision of mitigation measures to reduce noise impacts from increased traffic at NPWS campgrounds on Snowy Mountains Highway (Rocky Plain) and Link Road (3 Mile Dam). b) the CoA requires that the Construction Noise and Vibration management plan NV01 incorporate monitoring of traffic noise at NPWS campgrounds that may be impacted. <p>2)</p> <ul style="list-style-type: none"> a) Appendix S identifies the landscape character sensitivity of LCZ4: Gooandra Plateau as only moderate. Clarification needs to be provided as to why Gooandra Plateau has the same landscape character sensitivity as Rock Forest which is an operational farming landscape. NPWS view is that Gooandra Plateau should have the same sensitivity as Talbingo Reservoir, Talbingo Rugged Woodland, Tantangara Woodland or Tantangara reservoir and foreshore. b) the 'Visual Impact Assessment', include assessment and photomontages that include cumulative impacts from Exploratory Works roadworks and Transgrid Connection Project particularly from expanding viewpoints 4, 5 and 6. c) that viewpoint 7 is reassessed from a location approximately 1-2 km's south of its current position along Wallace Creek Trail where there is a clear view of Lobs Hole Ravine valley rather than the current obscured view. d) clarification is provided as to the view provided in Appendix S Plate 6-13, the description of the view is not correct in that it does not show the location for the substation.
--	--	--

		3) the CoA requires the provision of mitigation measures to reduce this visual impact and improve the amenity and biodiversity values of this impact zone. These measures should be to the satisfaction of NPWS.
--	--	--

8	Air	<p>Issues:</p> <p>1) MW EIS Table 6.38 identifies “<i>Adoption of mitigation similar to sealing 1km each side of the camps to minimise dust impacts to acceptable levels will achieve health-based criteria for the accommodation camp.</i>” However, similar mitigation measures have not been included for Wares Yards campground where exceedances of air quality are expected.</p> <p>Recommended action/conditions of approval:</p> <p>1) the CoA require that mitigation measure AQ01 include similar measures, namely sealing of Tantangara Road 1km each side of and at the entrance to Wares Yards campground.</p>
---	------------	---

9	Hazards	<p>Issues:</p> <p>1) the EIS identifies a significant quantity of excavated spoil will be placed on land in KNP. The contamination assessment conceptual site model for Lobs Hole Figure 6.22 also indicates possible pathways impacting on recreational users.</p> <p>2) MW EIS p.6-82 identifies impacts to the Traces Knob quarry site as part of the project.</p> <p>3) MW EIS Table 6.36 secondary access options.</p> <p>4) MW EIS Table 6.37 identifies hazard mitigation measures which require clarification.</p> <p>5) Appendix T Bushfire assessment requires clarification.</p> <p>Recommended action/conditions of approval:</p> <p>1) the CoA obligate SHL to ongoing monitoring/ maintenance and contamination removal (during both construction and operational phases) if required of any spoil emplacement.</p> <p>2) the CoA place obligations on SHL for ensuring the stability and safety at Traces Knob quarry to address “<i>potential safety issues concerning unstable rock walls at the quarry</i>” raised in Appendix O.2 Section 4.2.</p> <p>3)</p> <p>a) clarification is provided as to the secondary access for Marica as being “<i>North on Lobs Hole Ravine Road to Snowy Mountains</i>”</p>
---	----------------	---

		<p><i>Highway</i>". This access option is not feasible from Marica. Therefore prior to construction of Marica Road west to Mines Trail, PBP 2018 requirements cannot be met as there will be no secondary access for Marica.</p> <p>b) that the secondary access for Tantangara intake specifically nominate the secondary access east for clarity, a number of trails in this area have locked gates and many require access to private property which could hinder efficient egress.</p> <p>4) the CoA require HAZ05 be to the satisfaction of NPWS for all NPWS owned roads used for primary or secondary access.</p> <p>5)</p> <p>a) clarification is provided on detail in Appendix T Table 7 that identifies the FDI for Marica Accommodation as 50. This contrasts with the detail in Section 4.2 recommending an FDI of 80 for the Marica Accommodation site.</p> <p>b) clarification is provided as to why Marica Accommodation camp is not addressed in Table 49: performance criteria an acceptable solution for water, electricity and gas.</p>
--	--	---

10	Social	<p>Issues:</p> <ol style="list-style-type: none"> 1) the SEAR requires an assessment of the social impacts of the project on users of KNP, including recreational fishing, bushwalking, camping and boating. 2) the SEAR requires a strategy to offset the recreational impacts of the project on users of the KNP. Due to limitations in the level of design detail available, there has been limited discussion with NPWS in relation to any strategy or mitigation measures for recreational users. 3) MW EIS Table 6.43 identifies social and recreational mitigation measures which require clarification. 4) commitments outlined in correspondence from SHL to NPWS on the 15 June 2018 relating to 'terms of agreement for provision of compensation for predicted impacts on Kosciuszko National Park from the Snowy 2.0 Exploratory Works'. <p>Recommended action/conditions of approval:</p> <ol style="list-style-type: none"> 1) MW EIS 2.4.2 p.2-62 states due to previous approval no further assessment is required for Tantangara Reservoir. Recommend that due to a significant change in water fluctuations and impacts on established recreational use, an assessment of impacts should be made in order to meet the SEAR and assist in developing a strategy to offset the impacts on users of KNP. 2)
----	---------------	---

		<p>a) the CoA require that opportunities for future recreational use in KNP be identified and undertaken by the proponent to the satisfaction of NPWS.</p> <p>b) clarification is provided on detail shown in MW EIS Figure 2.26 which presents the operational footprint in Talbingo Reservoir, this is different to the exclusion zone in Appendix C (Bathymetry and indicative navigation exclusion zone) of Appendix W. (Navigation).</p> <p>c) the CoA require that all operational navigation exclusion zones are clearly mapped and included within the defined operational footprint.</p> <p>d) the CoA require that a strategy to offset the recreational and social impacts of the project in KNP and the rehabilitation strategy are completed to the satisfaction of NPWS. That the design and implementation timeframe are included in the CoA. Issues for consideration are but not limited to:</p> <ul style="list-style-type: none"> (i) proposed new landforms. (ii) reservoir access for boating due to exclusion zones. (iii) changed accessibility and resulting patterns of use. (iv) impacts on commercial operations. (v) that an interpretative plan addresses social, heritage, recreational, biodiversity and geodiversity values of KNP. That offsets incorporate the interactive use of archival recordings and removable heritage items salvaged from the project into displays within the project area. <p>3)</p> <p>a) the CoA require mitigation measure SOC2 to include NPWS in discussions on incidence of traffic congestion, recreational visitation and cumulative impact of Snowy 2.0 Main Works.</p> <p>b) the CoA require that all management plans directly related to KNP be completed and implemented to the satisfaction of NPWS.</p> <p>4) the CoA require that parking facilities at Wallace Creek Lookout are incorporated into road design on Lobs Hole Ravine Road to the satisfaction of NPWS.</p>
--	--	---

12	Consultation	Issues:
----	---------------------	----------------

		<p>1) provision of data gathered during the construction and operations phase of the project.</p> <p>Recommended action/conditions of approval:</p> <p>1) the CoA requires all information relating to Kosciuszko National Park gathered during development of the EIS, during construction and operation of the project to be provided to NPWS within 6 months of being gathered.</p>
--	--	---

13	Aboriginal Cultural Heritage (ACH)	<p>Issues:</p> <ol style="list-style-type: none"> 1) the proponent has demonstrated a consideration of potential impacts to ACH and provided an Aboriginal Cultural Heritage Assessment Report (ACHAR) consistent with the SEARs. 2) the ACHAR includes extensive archaeological field survey and archaeological test excavation program components across the northern part of KNP. It has significantly added to the number of recorded Aboriginal sites and the cultural heritage knowledge of the area. 3) as a large infrastructure project across an iconic national park there will be a considerable loss of heritage values. The management and mitigation actions of the report will be essential in minimising the impacts of the project to acceptable levels. 4) EES notes due to some recent additions to the project footprint some survey units are yet to be surveyed. Where necessary, un-surveyed areas must be investigated prior to project approval and assigned updated management and mitigation strategies. 5) it is noted that the ACHAR outlines that RAP consultation did not identify any specific socio-cultural information to the project area, but the identified Aboriginal sites have high cultural value to the local Aboriginal community through the tangible link they provide with their ancestral past. 6) EES supports the conclusions and recommendations in Chapter 10 of the ACHAR report. <p>Recommended actions/conditions of approval:</p> <ol style="list-style-type: none"> 1) a Cultural Heritage Management Plan (CHMP) is prepared and implemented to the satisfaction of EES. 2) the CHMP must be prepared in consultation with RAPs, NPWS and EES. It must include: <ol style="list-style-type: none"> a) describe Survey Units in which impacts are allowable. b) clearly map all areas of recorded Aboriginal sites within the project impact footprint. c) include procedures relating to the conduct of additional archaeological assessment, if required.
----	---	---

		<p>d) include management and mitigation measures for all areas to be impacted by the project footprint such as</p> <ul style="list-style-type: none"> • impacts to ground surfaces must be kept to an absolute minimum • for Survey Units which are assessed to be of higher significance values, impact mitigation measures will be implemented. These would comprise salvage • in the form of archaeological excavation and • archaeological analysis prior to impacts; and • the AHMP is to include measures for the • management of any Aboriginal objects that may be • found during construction. <p>3) unsurveyed Survey units that will be impacted as part of the design of the final footprint must be assessed and management/ mitigation recommendations provided to DPIE as part of the RTS phase</p>
--	--	---

11	<p>Flooding</p>	<p>Issues:</p> <ol style="list-style-type: none"> 1) the Flood Study prepared by GRC Hydro, which supports the Flood Risk Assessment, has been prepared in a manner consistent with current best practice and guidelines and is fit-for-purpose. 2) at most at flooding risk is the temporary and permanent accommodation camps proposed at both Lobs Hole and at Tantangara (adjacent to Kelly's Plain Creek) which have been assessed as largely flood free from riverine flooding. It also seems that the accommodation camp areas are entirely flood free in the 1% AEP event with only a small portion of the Lobs Hole camp marginally affected by less frequent flood events e.g. PMF. 3) there are flood refuge areas proposed well above the PMF at both accommodation camps which could be used during flash flooding events, but this needs to be detailed in the proposed Flood Emergency Response plans that are yet to be developed. These need to be developed in consultation with the NSW SES. 4) flood impacts of the various new and upgraded structures that cross major waterways has also been assessed. Although the impacts can be considered significant (localised up to 0.5m) they do not impact on any areas of significance and hence the risks are considered minor. 5) in regard to the operational phase impacts, the flood risk assessment concludes that there will be no significant change to the flooding characteristics of either Talbingo or Tantangara reservoirs due to the relatively small amount of rock emplacement being
----	------------------------	---

		<p>proposed in each. Although this has not been modelled it is accepted that any impact to downstream communities is likely to be minor.</p> <p>Recommended action/conditions of approval:</p> <p>The final project design should include:</p> <ol style="list-style-type: none"> 1) the appropriate design of infrastructure to minimise flood impacts and risks; and 2) the development of an appropriate Flood Emergency Response Plan for the protection of all personnel and the public during future flood events.
--	--	---

12	<p>Surface Hydrology and groundwater impacts.</p>	<p>Issues:</p> <ol style="list-style-type: none"> 1) the data and modelling presented in the EIS suggests that the project potentially will have a: <ul style="list-style-type: none"> • significant loss of groundwater dependent vegetation including bogs and fen community • significant water loss through groundwater drawdown and inflow to the works tunnel. • significant baseflow losses to streams above areas of groundwater depressurisation • significant changes to the surface hydrology due to swamp/bog/fen and stream impacts. 2) these issues were raised and discussed at the site meeting 17-18 October 2019 between representatives from NPWS, B&C, SHL and EMM. It was identified that the data and modelling presented in the EIS was based on the worst-case scenario of hydrological impacts. According to EMM and SHL, this scenario does not take account the many mitigation aspects of the current project design. They stated that further modelling data information is available that could be provided to EES to more accurately reflect likely impacts. <p>Recommended actions/conditions of approval:</p> <ol style="list-style-type: none"> 1) that further data, modelling and description of mitigation measure be provided. 2) that EES Science Division have an opportunity to comment on the updated water assessment information and provide comments at later date.
----	--	---



Attachment B: Detailed BDAR review against BAM requirements

OEHS EIS review

Officer: A Jenkins

Project: Snowy Hydro 2.0

Date: 25-10-2019

Requirements for a Biodiversity Development Assessment Report (major projects) and a Biodiversity Certification Assessment Report (strategic biodiversity certification proposals) (Appendix 10)

There are three stages to the BAM:

Stage 1 – Biodiversity assessment

Stage 2 – Impact assessment

Stage 3 – Improving biodiversity values

The Biodiversity Development Assessment Report (BDAR) and Biodiversity Certification Assessment Report (BCAR) is prepared to document the first two of these three stages and is submitted as part of an application for development (BDAR) or a biodiversity certification proposal (BCAR).

The minimum information requirements for the BDAR, depending on its specific purpose, are detailed in the following tables:

Table 25: Stage 1 Biodiversity Assessment – when part of an application for development or a biodiversity certification proposal

Table 26: Stage 2 Impact Assessment – when part of an application for development or a biodiversity certification proposal.

Stage 3 of the BAM is included in a Biodiversity Stewardship Site Assessment Report (BSSAR), the requirements for which are detailed in Appendix 11, Table 27.

Minimum information content for the reports is outlined below.



Table 25: Minimum information requirements for the Biodiversity Development Assessment Report and the Biodiversity Certification Assessment Report – Stage 1: Biodiversity assessment

Report section	Information Requirements	Maps & data requirements	BAM reference
Introduction	<p>Introduction to the biodiversity assessment including:</p> <ul style="list-style-type: none">• identification of development-site footprint, including:<ul style="list-style-type: none">◦ operational footprint◦ construction footprint indicating clearing associated with temporary construction facilities and infrastructure• general description of development• sources of information used in the assessment, including reports and spatial data.	<p>Site Map (as described in Section 4.2)</p> <p>Location Map (as described in Section 4.2)</p> <p>Digital shape files for all maps and spatial data</p>	Chapters 3 and 4



Report section	Information Requirements	Maps & data requirements	BAM reference
<p>Reference:</p> <ul style="list-style-type: none">• BDAR Section 1.2.2 (p3) Study Area:• Table 2.1 (p12) Project works• & Table 2.2 construction elements (p14)• Section 1.7 (p8): Information sources• Main EIS Appendix B Detailed Maps and Plans	<p>Review notes: Introduction</p> <ul style="list-style-type: none">• The Construction footprint is included in the “Disturbance footprint “(p3) which is the area where land could be directly disturbed by Snowy 2.0 Main Works and includes all areas subject to clearing and ground disturbance”• Detailed maps and plans Appendix B of EIS are not of sufficient detail to determine exact area of direct impact and indirect impact calculate and this is acknowledged in the BDAR, therefore the offset obligation has been determined based on a direct impact to the full disturbance footprint even though this may not occur. <div><p>RECOMMENDATION 1: Revised BAM assessment will be based on final design</p><p>Review of the construction footprint within the disturbance foot print will be required subject to submission of detailed design and final</p></div>		



Report section	Information Requirements	Maps & data requirements	BAM reference
Landscape features	<p>Identification of landscape features at the development/biodiversity stewardship site, including:</p> <ul style="list-style-type: none">• IBRA bioregions and subregions, NSW landscape region and area (ha)• native vegetation extent in the buffer area• cleared areas• evidence to support differences between mapped vegetation extent and aerial imagery• rivers and streams classified according to stream order• wetlands within, adjacent to and downstream of the site• connectivity features• areas of geological significance and soil hazard features• site context components, including:<ul style="list-style-type: none">◦ identification of method applied (i.e. linear or site-based)◦ percent native vegetation cover in the landscape (development site and biodiversity stewardship site)	<ul style="list-style-type: none">• IBRA bioregions and subregions (as described in Paragraphs 4.2.1.3-4.2.1.4)• NSW landscape regions (as described in Paragraph 4.2.1.5)• Rivers and streams (as described in Paragraph 4.2.1.6)• Wetlands (as described in Paragraph 4.2.1.7)• Connectivity of different areas of habitat (as described in Paragraphs 4.2.1.8-4.2.1.11)• Areas of geological significance and soil hazard features (as described in Paragraphs 4.2.1.12-4.2.1.15)• Native vegetation extent (as described in Subsection 4.3.2)	Section 4.2 and 4.3, Appendix 3

Report section	Information Requirements	Maps & data requirements	BAM reference
<p>Reference:</p> <ul style="list-style-type: none"> • BDAR S4 p31 p54 • Table 5.11 p118 	<p>Review notes: Landscape Features</p> <ul style="list-style-type: none"> • Rock Forest is located within the neighbouring South Eastern Highlands Bioregion to that which the BAM has been applied. This is considered satisfactory given the guidance in the BAM operation manual states: If the subject land is located within more than one IBRA subregion, the IBRA subregion selected should be the one within which the largest proportion of impact/improvement will occur, with justifications provided in the BAR'. However- given the mapping of PCT this also requires EMM to consider the potential for the EEC to occur within this area (refer comments next section) • Wetlands mapped by EMM do not identify the KNP bogs and fens mapped by Hope 2012. Mapping may need to be revised following the commonwealth feedback on what PCT's comprise the EEC • Existing cleared areas that have been removed from the assessment are not clearly identified in the BDAR however the spatial data indicates there are areas that have been removed. <div> <p>RECOMMENDATION 2: Revised Mapping to identify TEC's and Cleared Areas (Areas not requiring assessment):</p> <p>Revised mapping should identify:</p> <ul style="list-style-type: none"> • Bogs and Fens (Hope 2012) • Location and extent of EEC Montane peatlands (BC Act) and Alpine Bogs and Fens (EPBC Act) and CEEC Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion if present at Rock Forest (SAIL). If present, a revised assessment against BAM SAIL criteria for assessment would apply (BAM S10). </div>		<p><i>BAM Stage 1 ops Manual provides guidance</i></p>



Native vegetation	<p>Identify native vegetation extent within the development/biodiversity stewardship site, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery.</p> <p>Describe PCTs within the development/biodiversity stewardship site, including:</p> <ul style="list-style-type: none">• vegetation class• vegetation type• area (ha) for each vegetation type• species relied upon for identification of vegetation type and relative abundance• justification of evidence used to identify a PCT (as outlined in Paragraph 5.2.1.12)• TEC status (as outlined in Paragraphs 5.2.1.14–5.2.1.15)• estimate of percent cleared value of PCT (as outlined in Paragraph 5.2.1.16) <p>Perform a vegetation integrity assessment of the development/biodiversity stewardship site, including:</p> <ul style="list-style-type: none">• mapping vegetation zones (Subsection 5.3.1)• patch size (development site)• assessing vegetation integrity using benchmark data (Subsection 5.3.3)• survey effort as described in Subsection 5.3.4 (number of plots)• determining the vegetation integrity score (Appx 6):<ul style="list-style-type: none">○ composition condition score○ structure condition score○ function condition score <p>vegetation integrity score. Where use of local data is proposed:</p>	<ul style="list-style-type: none">• Map of native vegetation extent within the development/biodiversity stewardship site (as described in Section 5.1)• Map of PCTs within the development (as described in Section 5.2)• Map of plot locations relative to PCTs• Map of TECs• Plot field data (MS Excel format)• Plot field data sheets• Patch size of intact native vegetation (as described in Subsection 5.3.2)• Table of current vegetation integrity scores for each vegetation zone within the development/biodiversity stewardship site.	Chapter 5 and Appendix 6
----------------------	--	---	-----------------------------



Report section	Information Requirements	Maps & data requirements	BAM reference
	<ul style="list-style-type: none">• identify relevant vegetation type• identify source of information for local benchmark data• justify use of local data in preference to database values.		

<p>Reference:</p> <ul style="list-style-type: none"> • BDAR S5.2.2 p51 Figures 5.1.1, 5.1.2, 5.1.13, -5.1.14, 5.1.17, 5.1.18, 5.1.22 • Targeted survey S6.3.3 p164& Figure 6.1.1-4, 6.1.29 & 	<p>Review notes: Native Vegetation:</p> <ul style="list-style-type: none"> • The BDAR acknowledges a shortfall in plot numbers and compensates by assuming benchmark condition (VI score of 100) where zones did not have plots and duplication of a small number of other plots to achieve the number of plots required. • DPIE acknowledge the extensive survey effort by EMM across a broad study area however there is some concern in regard to the proximity of plots used to provide BAM data for some vegetation zones in the impact area. This could be interpreted as potential for error/inaccuracies in PCT allocation, veg zoning and ultimate credit calculations and offset obligation. • Although DPIE acknowledge that PCT allocation was highly accurate at DPIE site inspection, comprehensive on ground verification of all areas was unachievable due to time constraints of the review period. EMM advised that a revision of plot proximity to veg zones could be undertaken prior to the response to submissions. • EMM acknowledged that there are some areas within the disturbance footprint that were not surveyed for threatened flora and fauna due to the altered final disturbance footprint post survey (p164) • These unsurveyed areas can be seen in the BDAR Figures 6.1.1, 6.1.3, 6.1.4, 6.1.29, and 6.1.27 (Rock forest property outside KNP)) and via analysis of the spatial data provided. • EMM consider Montane peatlands EEC (BC Act) & EPBC listed Alpine bogs and associated fens EEC to be constrained to PCT 637. PCT 637 extent (Figure 4.2) does not correspond with Geoff Hope KNP mapped bogs and fens. Justification for this was discussed and resolved at site inspection 17 October 2017 with DPIE expert Keith McDougall. DPIE are satisfied that the Stygofauna assessment (P8) considered all KNP bogs and fens, and the outcome of the BAM assessment would not be affected by any inconsistency with Hope mapping. • EMM have considered all three PCT's 1225, 637 and 765 to be groundwater dependant ecosystems • DPIE (Keith McDougall and Geoff Robertson) resolved EEC mapping at DPIE site inspection 17/10/2019 and agree with exclusion of PCT 1225 from the EEC, however EEC should still be identified in maps and figures within the BDAR. 	<p><i>BAM Stage 1 Ops Manual: Where multiple discontinuous areas of vegetation form a vegetation zone, plots must be evenly distributed across these areas if size permits. If size is restrictive, as a minimum, at least one plot should be placed in each of the separate areas.</i></p> <p><i>BAM S5.2 Mapping of PCT's and TEC'</i></p> <p><i>BAM S10.2 SAI</i></p> <p><i>BAM plots S 5.3.4</i></p>
--	--	--

Report section	Information Requirements	Maps & data requirements	BAM reference
	<p>RECOMMENDATION 3: Undertake additional survey to complete BAM stage 1 Assessment:</p> <p>DPIE acknowledge the EMM survey for Snowy 2.0 has resulted in significant addition to our knowledge of the biodiversity values of the northern section of KNP however the gaps that are acknowledged in the survey data due to uncertainty of the final disturbance footprint should be addressed in a revised BDAR. In consideration of this the following is required:</p> <ul style="list-style-type: none"> - Additional plots shall be undertaken in vegetation zones that are below the minimum BAM requirement - Revision of plots proximity to vegetation zones within the impact area and additional plots shall be undertaken if required - Additional flora and fauna survey should be undertaken in areas of disturbance footprint not subject to targeted survey <p>Revised mapping should identify location and extent of EEC Montane peatlands (BC Act), Alpine Bogs and Fens (EPBC Act) and CEEC Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion if present at Rock Forest (SAIL) and any other threatened species detected as a result of the additional surveys. If present, a revised assessment against BAM SAIL criteria for any SAIL species or communities detected as a result of the additional survey would apply (BAM S40)</p>		
Threatened species	<p>Identify ecosystem credit species associated with PCTs on both the development site as outlined in Section 6.2, including:</p> <ul style="list-style-type: none"> • list of species derived • justification for exclusion of any ecosystem credit species predicted above. <p>Identify species credit species on both the development site as outlined in Sections 6.3 to 6.5, including:</p> <ul style="list-style-type: none"> • list of candidate species • justification for inclusions and exclusions based on habitat features 	<ul style="list-style-type: none"> • Table of habitats or habitat components and their sensitivity classes • Table detailing the list of species credit species and presence status on site as determined by targeted survey, indicating also where presence was assumed and/or where presence was determined by expert report • Species credit species polygons (as described in Paragraph 6.4.1.33) • Table detailing species and habitat feature/component associated with species 	Chapter 6



Report section	Information Requirements	Maps & data requirements	BAM reference
	<ul style="list-style-type: none">• indication of presence based on targeted survey or expert report• details of targeted survey technique, effort, timing and weather• species polygons• biodiversity risk weighting for the species• threatened species survey• additional requirements for wind farm developments. <p>Where use of local data is proposed:</p> <ul style="list-style-type: none">• identify relevant species• identify aspect of species data• identify source of information for local data• justify use of local data in preference to database values. <p>Where expert reports are used in place of targeted survey:</p> <ul style="list-style-type: none">• identify the relevant species• justify the use of an expert report• indicate and justify the likelihood of presence of the species and information considered in making this assessment• estimate the number of individuals or area of habitat (whichever unit of measurement applies to the species/individual) for the	<p>and its abundance on site (as described in Paragraph 6.4.1.34)</p> <ul style="list-style-type: none">• Table detailing biodiversity risk weighting for species on site (as described in Section 6.6)• For wind farm developments: maps of habitual flight paths for nomadic and migratory species likely to fly over the site and maps of likely habitat for threatened aerial species resident on the site.	

Report section	Information Requirements	Maps & data requirements	BAM reference
	development site, including a description of how the estimate was made		
<p>Reference:</p> <ul style="list-style-type: none"> • BDAR S5.4.p51 • S6.3.3 p164 • Table 6.1p153 	<p>Review notes Threatened Species:</p> <ul style="list-style-type: none"> • Candidate Species: DPIE acknowledge the significant consultation and survey effort undertaken by EMM. However the BDAR does not provide documentation in accordance with BAM for the exclusion of several candidate species from the assessment and acknowledges targeted surveys were undertaken prior to the final disturbance footprint being provided (p164). The BDAR also acknowledges that survey for small number of plots were completed after flowering period for some species (p51). As a result, some species were not identifiable to genus level. Because of this, the BDAR should address these gaps and provide further justification for the exclusion of the following species credit species: <ul style="list-style-type: none"> • White Bellied- Sea Eagle, <i>Haliaeetus leucogaster</i>, (breeding): Species was recorded by EMM within the disturbance footprint at Tantangara and Talbingo Dams. Requires targeted survey, expert report or degraded habitat assessment to exclude breeding habitat) • Little Eagle, <i>Hieraaetus morphnoides</i> (Breeding): Requires targeted survey expert report or degraded habitat assessment to exclude breeding habitat • Square-tailed kite (Breeding): Requires targeted survey expert report or degraded habitat assessment to exclude breeding habitat • <i>Euphrasia Scabra</i> (SAII): Requires targeted survey, expert report or degraded habitat assessment to exclude as a candidate. • Alpine She Oak Skink is known to occur in PCT 1225 in KNP (Refer to comments provided by Mel Schroder (Snr Conservation Planning Officer NPWS Attached 1) and was recorded on the boundary of PCT 1225 by EMM in a number of locations: The EMM spatial data provided shows species polygons were created over the PCT 1225 zones, yet PCT 1225 was not included in the BDAR or assessment for calculation of species credit obligation. • Further justification is required on why the calculation of credit obligation for the Alpine She Oak Skink does not PCT 1225. 		

Report section	Information Requirements	Maps & data requirements	BAM reference
	<p>RECOMMENDATION 4: Address candidate species excluded from the Assessment</p> <p>DPIE acknowledge that EMM have undertaken significant consultation with DPIE staff regarding survey for Snowy 2.0 and that survey has resulted in significant addition to our knowledge of the biodiversity values of the northern section of KNP, however the methodology requires the BDAR to provide further justification for the exclusion of a number of species credit species predicted to occur within the plant community types present within the study area:</p> <ul style="list-style-type: none"> • White Bellied- Sea Eagle, <i>Haliaeetus leucogaster</i>, (breeding): Species was recorded by EMM within the disturbance footprint at Tantangara and Talbingo Dams. Requires targeted survey, expert report or degraded habitat assessment to exclude breeding habitat) • Little Eagle, <i>Hieraaetus morphnoides</i> (Breeding): Requires targeted survey expert report or degraded habitat assessment to exclude breeding habitat • Square-tailed kite (Breeding): Requires targeted survey expert report or degraded habitat assessment to exclude breeding habitat • <i>Euphrasia Scabra</i> (SAll): Requires targeted survey, expert report or degraded habitat assessment to exclude as a candidate <p>RECOMMENDATION 5: Recalculate Species credit obligation for Alpine She-oak Skink</p> <p>The calculation of credit obligation for the Alpine She Oak Skink must include all areas and associated vegetation zones mapped within the EMM species polygons (including PCT 1225), as reflected by the spatial data provided. This is supported by DPIE given the proximity</p>		<p>6.4.1.17 BAM</p> <p>BAM 6.4.1.33</p>



Table 26: Minimum information requirements for the BDAR or BCAS. Application for a development consent or biodiversity certification – Stage 2: Impact assessment (biodiversity values)

Report section	Information		Maps & data		BAM reference
Avoid and minimise impacts		<p>Demonstration of efforts to avoid and minimise impact on biodiversity values in accordance with Chapter 8.</p> <p>Assessment of direct and indirect impacts unable to be avoided at the development site in accordance with Sections 9.1 and 9.2. The assessment would include but not be limited to: type, frequency, intensity, duration and consequence of impact.</p> <p>For major projects: details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (Section 9.4).</p>		<p>Table of measures to be implemented before, during and after construction to avoid and minimise the impacts of the project, including action, outcome, timing and responsibility</p> <p>Map of final project footprint, including construction and operation</p> <p>Maps demonstrating indirect impact zones where applicable</p>	Chapter 8
<p>Review:</p> <p>(Section 7.2.2, Table 8.1 p491, Section 8.2.2, Section 8.5 Section 9.3.5.1 & Appendix K1)</p>	<p>IMPACTS:</p> <p>Direct:</p> <p>Uncertain extent – will need to be address in a revised assessment due to the impact on credit obligation and requirement to address indirect prescribed and uncertain impacts</p> <p>Indirect Impacts</p> <p>Consideration has not been given to indirect impacts on resource availability critical for the survival of Mountain Pygmy Possum as well as the foraging behaviour of Smoky Mouse due to artificial lighting at night (ALAN). ALAN can strongly alter habits of nocturnally active species. Specifically, DPIE is</p>				<p>BAM 9.3</p> <p>BAM 9.4</p> <p>BAM 10.2 & 10.3</p>

Report section	Information	Maps & data	BAM reference
Executive summary (E4-5), Annexure G SAII Assessment Annexure K1 EPBC significant impact criteria assessment	<p>concerned about Bogong Moth, a critical resource to Mountain Pygmy Possum, which in recent years which has undergone precipitous decline, in part, due to light traps. The Proponent should explore potential avoidance, minimisation and mitigation measures such as:</p> <ol style="list-style-type: none"> Avoid using artificial lighting during the Spring migration and Summer foraging period. Installation motion activated lights. Prevention of incidental scattered light flow into surrounding habitat using light batters on lights. Use warm-coloured, long wavelength LED lights that produce a yellow /orange hue rather than cool-coloured, short wavelength blue light. <p>Prescribed & Uncertain Impacts</p> <ul style="list-style-type: none"> Groundwater drawdown: While Snowy Hydro propose to minimise impacts to 28 ha of obligate GDEs by pre-grouting the concrete tunnel, DPIE are very concerned about the high level of residual risk, the uncertainty regarding the level of impact and the potentially lengthy time delay between impacts occurring and the impacts manifesting. The BDAR should detail the requirements of an adaptive management strategy to measure and respond to these impacts and to secure and deliver potential offsets in line with section 9.4.2.2 of the BAM and the Addendum to NSW Biodiversity Offsets Policy for Major Projects (Upland Swamp Policy), which includes: <ol style="list-style-type: none"> Indicators to detect impacts on the target entities. A methodology for the collection of baseline data and an impact monitoring program with timeframes and design requirements that are supervised by an independent expert panel (IEP) selected by DPIE and funded by the Proponent. This should include detailed mapping of the target entities from increased survey effort that covers the entire drawdown area in an appropriately randomised and stratified manner. A decision-making framework to be followed by the IEP in determining if impacts have occurred and to what extent. This should include a process to calculate and retire an offset if impact thresholds are exceeded. The Proponent must be able to demonstrate legal ability to secure the maximum predicted offset liability based on the maximum predicted groundwater drawdown. A commitment to undertaking annual reporting on a – c that is made publicly available on the Snowy Hydro website. 		<p>s9.4 BAM Uncertain impacts OEH-2014/0672 Upland swamp policy</p>



Report section	Information	Maps & data	BAM reference
	<ul style="list-style-type: none">Vehicle strikes, fragmentation and increased predation The BDAR must make an assessment about the consequences of the impact at state and bioregional scale in accordance with section 9.2.1.9 of the BAM and 2.5.3 of the BAM Stage 2 Operational Manual. This assessment must be supported by evidence in the form of modelling, literature, unpublished but peer reviewed reports or consultation with experts. The BDAR should detail the requirements of an adaptive management strategy to measure and respond to these impacts in accordance with Section 9.4.2.4 of the BAM, which includes:<ul style="list-style-type: none">Indicators to detect impacts on the target entities.A methodology for the collection of baseline data and an impact monitoring program with timeframes and design requirements that are supervised by an independent expert panel (IEP) selected by DPIE and funded by the Proponent.A decision-making framework to be followed by the IEP in determining if impacts have occurred and to what extent.Adaptative management measures to be undertaken once impact thresholds have been exceeded.A detailed description and costing for the long-term management of the minimisation and mitigation measures. These measures should include:<ul style="list-style-type: none">Culverts underneath Lobs Hole Road that are designed to be compatible with the unique ecology and behaviour of the target entities.Fencing along Lobs Hole Road.A predator monitoring and control program that is target around fences and culverts.Localised lighting along fences to reduce predator efficiency.Consideration of alternative technologies in accordance with BAM S8.2.2.2(a) through collaboration with Dr John Reed about the implementation of the 'Felixer' system to control feral cats.A commitment to upfront funding for the ongoing management of the minimisation and mitigation measures.Consideration of how to integrate the measures into Parks' other operations.a commitment to undertaking annual reporting on a – e that is made publicly available on the Snowy Hydro website. <p>Prescribed Impacts</p>		



Report section	Information	Maps & data	BAM reference
	<p>The following additional work should be undertaken in relation to prescribed impacts to water quality and hydrological processes that sustain TECs:</p> <ol style="list-style-type: none">make an assessment about the consequences of the impact of the development on all water bodies in accordance with section 9.2.1.7 of the BAM.Explain why only impacts to Yarrangobilly River are avoided and detail the evidence that there will not be prescribed impacts to other waterways surrounding the development.Detail the evidence informing the 50 m buffer zone. Has the proponent considered standard techniques for determining the design of the buffers?Develop the Erosion and Sediment Control Plan prior to consent. <p>MEASURES TO AVOID:</p> <p>DPIE acknowledge there has been significant measures to avoid impacts to biodiversity values namely:</p> <ul style="list-style-type: none">Siting of stockpiles for excavated materials in low-quality vegetation where possible.Siting of the Exploratory Works camp in partially cleared areas.Removal of plateau power station complex option, reducing impacts to sensitive habitats in the plateau area.Change in power station complex location in the Marica area, including construction method, resulting in removal of elements and reduction in impacts.Location of the Marica ventilation shaft in existing cleared areas.Investigation of alternative locations for the communications cable routes, including removal of the southern communication route adjacent to the Snowy Mountains Highway.Moving of the southern communications route south at Boggy Plain to avoid sensitive Alpine bogs and fens and sub-alpine grassland habitat.Installation of the communications cable in existing firetrails.Development of a 50 m buffer zone along the Yarrangobilly River and avoidance and minimisation of works within this buffer &Siting of key infrastructure away from sensitive receiving environments. <p>MEASURES TO MINIMISE:</p>		



Report section	Information	Maps & data	BAM reference
	<p>The final design of the project may allow for further minimisation of impacts within the currently identified disturbance footprint. This will be of particular importance to Smoky Mouse habitat, as currently the SAI assessment and EPBC significant impact criteria assessment provided by EMM indicates a significant and unacceptable impact on Smoky Mouse will occur as a result of Snowy 2.0</p> <p>Smoky Mouse (SAI BC Act, CE EPBC Act)</p> <ul style="list-style-type: none">• The SAI assessment by EMM considers direct impacts will remove >174ha of Smoky Mouse habitat considered important to the conservation of the species. EMM consider this, combined with the indirect impact of vehicle strike, disease and predation has the potential to fragment and isolate Smoky Mouse recorded to the north of the disturbance footprint at Marica due to the removal of large areas of intact vegetation.• The EPBC significant impact criteria assessment (Appendix K1) concludes that this impact is significant. As submitted, DPIE would concur with this conclusion. A reduced footprint and additional mitigation measures were discussed at site inspection with DPIE ecologist Linda Broome 18 October 2019. A reduced construction footprint is considered likely subject to review of final design. This reduced direct impact combined with tailored mitigation measures designed in consultation with DPIE to minimise indirect impacts should be included in a revised BDAR following review of final design.• Site inspection 18 October 2019 between NPWS & DPIE staff, (including Linda Broome Threatened Species Officer), Snowy Hydro representatives and EMM discussed a combination of mitigation measures that could be used including the use of road underpasses designed in consideration of those operating successfully for the Eastern Pygmy Possum at Schlunks Pass. <p>ADAPTIVE MANAGEMENT FOR UNCERTAIN IMPACTS</p> <p>Groundwater drawdown is identified by EMM as a prescribed and indirect impact on groundwater dependant ecosystems & much of this area is outside the disturbance footprint and lacking survey data.</p> <ul style="list-style-type: none">• This impact is considered by EMM as a high biodiversity risk and uncertain impact for which S9.4 BAM requires an adaptive management strategy to address potential future impacts and offsetting requirements.• EMM (S7.3 p453) identify >17ha of PCT 637 (TEC) and Groundwater dependant ecosystems (<3ha PCT 765 and 10.37ha PCT1225) at high risk of impact by worst case scenario drawdown. 23.69ha PCT 303 is identified as low risk of impact• The potential offset liability (as per Upland swamp policy) would require a calculation of offset obligation for the above PCT's and associated species credit species prior to approval which may require identification of gaps in the survey data across the drawdown area given the following:<ul style="list-style-type: none">• Disturbance footprint (as per p3 BDAR) =1678 ha)• Drawdown area =2510 ha Drawdown area subject to veg mapping=2175ha• Drawdown area within disturbance footprint =1451 ha. Area (ha) NOT included in disturbance footprint =1,059 ha.• Vegetation NOT mapped within the drawdown area =335 ha		



Report section	Information	Maps & data	BAM reference
	Area of survey (survey area as per p 3 of BDAR "Surveys have been undertaken over a broad area") = Area unknown		

RECOMMENDATION 5: Plans showing final project design and footprint, including construction and operation must be provided to inform a revised BDAR , impact assessment (including direct, indirect, prescribed and uncertain) impacts in accordance with BAM requirements) and credit obligation.

RECOMMENDATION 6: Minimise and mitigate impacts to Smoky Mouse following revised assessment of direct and indirect impacts

DPIE acknowledge that survey for Snowy 2.0 has resulted in a significant finding of a large regional population of Smoky Mouse, however given the level of impact to >174ha of Smoky Mouse critical habitat combined with the ongoing indirect impact of fragmentation, vehicle strike, habitat degradation and predation, DPIE agree with the conclusion of significant impact to the species. Given that the disturbance footprint has potential to be reduced subject to the final design, there is potential to minimise this direct impact. There is also potential to further minimise impacts via a combination of mitigation measures designed in consultation with DPIE staff including the use of road underpasses such as those operating successfully for the Eastern Pygmy Possum at Schlinks Pass.

A revised assessment (BDAR) should address a revised final design and construction footprint to minimise impacts to Smoky Mouse critical habitat and the additional measures to mitigate impacts in consultation with DPIE.

RECOMMENDATION 7: Provide Adaptive Management Strategy for uncertain impacts to Groundwater dependant ecosystems and Smoky Mouse prior to approval

- The impact assessment acknowledges there is a high biodiversity risk to groundwater dependant ecosystems associated with potential drawdown. Any loss of community as a result of groundwater depressurisation may have greater than negligible consequences and risk Serious and Irreversible impacts to a number of BC listed entities and MNES (EPBC Act) and require adaptive management, monitoring and potential offsetting in line with DPIE policy for upland swamps.
- Uplands Swamp Policy requires an adaptive Management Strategy to be designed in consultation with DPIE and undertake 2 years of pre-impact piezometric monitoring under the supervision of the Independent Expert Panel (IEP funded by proponent and appointed by DPIE) who will advise the consent authority.
- if the GDEs will be subject to greater than negligible environmental consequences, the proponent must demonstrate the legal ability to secure the maximum predicted offset liability based on the maximum predicted groundwater drawdown
- The IEP determines if the actual impacts are greater, less than or equal to the maximum predicted offset liability
- If the actual impact does have a greater than negligible environmental consequence then the proponent fulfils its offset liability
- At any time, the proponent may acquit the full value of the offset by purchasing and retiring credits or through supplementary measures in accordance with the BAM
- Baseline survey data of the biodiversity values within the groundwater drawdown affected areas would need to be provided to inform the adaptive management strategy and will require,
 - Verification of PCT's and vegetation management zones within the drawdown area
 - Additional targeted surveys where this has not been undertaken within the groundwater drawdown area
- The adaptive management strategy for uncertain impacts must be designed in consultation with DPIE in line with the DPIE policy for [upland swamps](#).



Report section	Information		Maps & data		BAM reference
Impact summary		<p>Identification and an assessment of the impacts that are potential serious and irreversible impacts, in accordance with Subsection 10.2.2 for impacts on CEECs and 10.2.3 for threatened species.</p> <p>Identification of impacts requiring offset in accordance with Section 10.3</p> <p>Identification of impacts not requiring offset in accordance with Paragraph 10.3.2.2</p> <p>Identification of areas not requiring assessment in accordance with Section 10.4</p>		<p>Map showing the location of serious and irreversible impacts</p> <p>Map of impacts requiring offset</p> <p>Map of impacts not requiring offset</p> <p>Map of areas not requiring assessment</p>	Chapter 10
Reference:	<p>Review notes:</p> <ul style="list-style-type: none">• Clarification of areas not requiring assessment: areas may be removed from the assessment if they do not contain native vegetation. GIS shapefiles indicate some areas along tracks/trails have been removed. <p>This has been addressed in previous sections recommendations</p>				



Report section	Information		Maps & data		BAM reference
Impact summary		<p>Ecosystem credits and species credits that measure the impact of the development on biodiversity values, including:</p> <p>future vegetation integrity score for each vegetation zone at the development site (Equations 17 and 18 in Appendix 6)</p> <p>change in vegetation integrity score (Subsection 9.1.3)</p> <p>number of required ecosystem credits for the impact of development on each vegetation zone at a development site (Subsection 11.2.3)</p> <p>number of required species credits for each threatened species that is impacted on by development (Subsection 11.2.4).</p>		<p>Table of PCTs requiring offset and the number of ecosystem credits required</p> <p>Table of threatened species requiring offset and the number of species credits required</p> <p>Submitted proposal in the Credit Calculator</p>	Subsections 11.2.3 and 11.2.4
Review notes	<ul style="list-style-type: none">• BDAR (Es5) acknowledges direct, indirect and prescribed impacts extensively. Uncertain impacts are identified including groundwater drawdown as an indirect impact -comments provide above• Review of final design may alter the credit obligation <p>RECOMMENDATION 8 (also addressed in previous section)</p> <p>Review of impact assessment will be required following submission of revised plans showing the final design of construction footprint – this has been addressed in previous recommendations</p>				



Report section	Information		Maps & data		BAM reference
Biodiversity credit report		Credit classes for ecosystem credits and species credits at the development site.		Table of credit class and matching credit profile	Subsection 11.3
Not specifically addressed	<p>Total credit obligation has been provided in line with BAM requirements however this has the potential to change with the following inputs required in a revised BDAR:</p> <ul style="list-style-type: none">oRevision of Direct impacts determined by final designoRevision of indirect impacts determined by final designoRecalculation of biodiversity credits determined by final design and additional survey data<ul style="list-style-type: none">oRecalculation of Alpine-She-oak skink credits in accordance with BAM 11.2.4 <p>RECOMMENDATION 9 (also addressed in previous sections): a revised credit obligation is to be determined following the results of additional surveys and re-application of BAM on final design footprint</p>				

2: Exclusion of Candidate species

Species Credit Species Excluded	Targeted survey?/expert report?	Excluded from	BDAR justification	S6.4BAM compliant?
<i>Euphrasia Scabra</i> Rough Eyebright	No	All zones	Occurs in or at the margins of swampy grassland or in	No -BAM 6.4.1.17- requires degraded habitat



Species Credit Species Excluded	Targeted survey?/expert report?	Excluded from	BDAR justification	S6.4BAM compliant?
			<p>sphagnum bogs, often in wet, peaty soil.</p> <p>There are three known populations in NSW: Bondi State Forest, South East Forests National Park and near Nunnock Swamp.</p> <p>The project area does not contain suitable habitat for this species, therefore it is unlikely to occur.</p>	<p>assessment or expert report</p> <p>Justification/follow up is required</p>
<i>Irenepharsus magicus</i> Elusive Cress	No	All zones	<p>The distribution of the Elusive Cress is not known, with information provided with a single collection within the vicinity of Geehi Dam. The record of the species in NSW includes the habitat note "growing on mineral soil of embankment". The species was also recorded in a rocky limestone area in eastern Victoria.</p>	<p>No- BAM 6.4.1.17- requires degraded habitat assessment or expert report although consultation with DPIE experts advise it is an unlikely candidate.</p>



Species Credit Species Excluded	Targeted survey?/expert report?	Excluded from	BDAR justification	S6.4BAM compliant?
			The project area does not contain suitable habitat for this species, therefore it is unlikely to occur.	
<i>Anthochaera phrygia</i> Regent Honeyeater (Breeding)	No	All zones	Not within mapped area	yes
<i>Calyptorhynchus lathamii</i> Glossy Black-Cockatoo (Breeding)	No		Inhabits coastal woodlands and drier forest areas, open inland woodlands, or timbered watercourses where its main food source, the casuarina (she-oak) is common. The project area does not support suitable breeding habitat with dominant She-oak (<i>Allocasuarina</i> spp.) and is outside of the known range.	No- BAM 6.4.1.17- technically requires degraded habitat assessment or expert report. EATS advise follow up for this species not required – may review TBDC constraints



Species Credit Species Excluded	Targeted survey?/expert report?	Excluded from	BDAR justification	S6.4BAM compliant?
Yellow-bellied Glider on Bago Plateau	No	All veg zones	Outside geographic constraint	yes
<i>Haliaeetus leucogaster</i> Whitebellied Sea-Eagle (Breeding)	No	All veg zones	No nests suitable for the species were observed during the habitat assessment. Breeding habitat unlikely to occur within the disturbance footprint.	No- BAM 6.4.1.17- technically requires degraded habitat assessment or expert report. Targeted survey was conducted however the BDAR excludes the species
<i>Hieraaetus morphnoides</i> Little Eagle (Breeding)			The Little Eagle occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. The species nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter.	No- BAM 6.4.1.17- technically requires degraded habitat assessment or expert report.



Species Credit Species Excluded	Targeted survey?/expert report?	Excluded from	BDAR justification	S6.4BAM compliant?
			No nests suitable for the species were observed during the habitat assessment. Breeding habitat is unlikely to occur within the disturbance footprint.	
<i>Litoria spenceri</i> Spotted Tree Frog	No	All veg zones	The Spotted Tree Frog is extremely rare and occurs in scattered, geographically isolated populations. Historically it was known from two streams in southern NSW on the north-west side of the Great Dividing Range; however, both populations appeared to have become locally extinct. One population has been re-established via a reintroduction program. It occurs among boulders or debris along naturally	Given habitat constraints are present BDAR should have provided expert report. D Hunter (DPIE) confirms the targeted survey effort for amphibians would have detected this species if present/and it is not a suitable candidate.



Species Credit Species Excluded	Targeted survey?/expert report?	Excluded from	BDAR justification	S6.4BAM compliant?
			vegetated, rocky fast flowing upland streams and rivers. Due to extremely limited population distribution in NSW this species is considered unlikely to occur within the project area.	
<i>Lophoictinia isura</i> Square tailed Kite (Breeding)	No	All zones	The Square-tailed Kite is found in a variety of timbered habitats including dry woodlands and open forests. The species shows a particular preference for timbered watercourses, where nests are constructed in a fork or on large, horizontal limbs. No nests suitable for the species were observed during the habitat	No- BAM 6.4.1.17- technically requires degraded habitat assessment or expert report.



Species Credit Species Excluded	Targeted survey?/expert report?	Excluded from	BDAR justification	S6.4BAM compliant?
			assessment. Breeding habitat is unlikely to occur within the disturbance footprint.	
<i>Miniopterus schreibersii</i> <i>oceanensis</i> <i>Eastern</i> <i>Bentwing bat</i> (Breeding)	No- habitat constraints	All zones	Caves are the primary roosting habitat, but also use derelict mines, stormwater tunnels, buildings and other man-made structures. Maternity caves have very specific temperature and humidity regimes and are known from a limited number of sites across the species range. The project area does not contain suitable breeding habitat for this species. The project area does not support any maternity roosts.	Yes-Breeding Habitat constraints not present-



Review of Candidate Species: Without an assessment of degraded habitat against BAM S 6.4.1.17, targeted survey or expert report to confirm absent, the assessor must assume presence (6.4.1.21)for the Rough Eyebright, Whitebellied Sea-Eagle (Breeding), Little Eagle (Breeding), &Square tailed Kite (Breeding)

4: Indirect and prescribed impacts (S 9 BAM):

Groundwater drawdown impacts

EMM acknowledge there are uncertain impacts associated with the potential groundwater drawdown. The BDAR (section 7.5 p456) identifies groundwater dependant ecosystems, PCTs 1225 and 637 to be at highest risk of impacts associated with groundwater drawdown given the level of drawdown, the entirely/obligate dependence of these communities on groundwater and possible changes in species composition.

BCD disagree with EEM that this uncertain risk can overall be considered as 'low' because these impacts will occur to a small portion of these communities at a local, NSW and national scale.

EMM have indicated that (in EPBC Act significant impact criteria Assessments annexure K1) that the groundwater drawdown may impact >17ha the plant community PCT 637

The mitigation measures required by Serov et al. (2012) for GDEs at high risk include:

- protection of aquifer and GDE catchment / sub-catchments;
- monitoring to ensure no change to risk;
- mitigate impact and apply water sharing plan rules; and
- monitor effectiveness of mitigation strategy using appropriate indicators.

No adaptive management strategy is outlined. A monitoring program is proposed to be implemented to ensure actual impacts are within or less than predicted. If actual impacts are greater than predicted, adaptive management will be implemented. The monitoring program is proposed to be determined as a part of the Biodiversity and Groundwater Management Plans to be developed post-approval. This does not align with DPIE Uplands Swamp Policy for uncertain impacts.

BAM S9.4.2.2 requires a strategy for monitoring changes to groundwater and secondary environmental consequences in accordance with the Upland swamp policy. A strategy for offsetting in accordance with policy is also required. BAM does not specify the strategy is required prior to approval however, the BDAR is required to specify the requirements of the strategy.

Further survey and assessment of drawdown impacts areas would be required to form baseline data for monitoring surveys and determine potential credit obligation and offset requirement.

Groundwater Dependent Ecosystem Impact summary

The Proponent's mapping demonstrates the following in relation to groundwater drawdown:

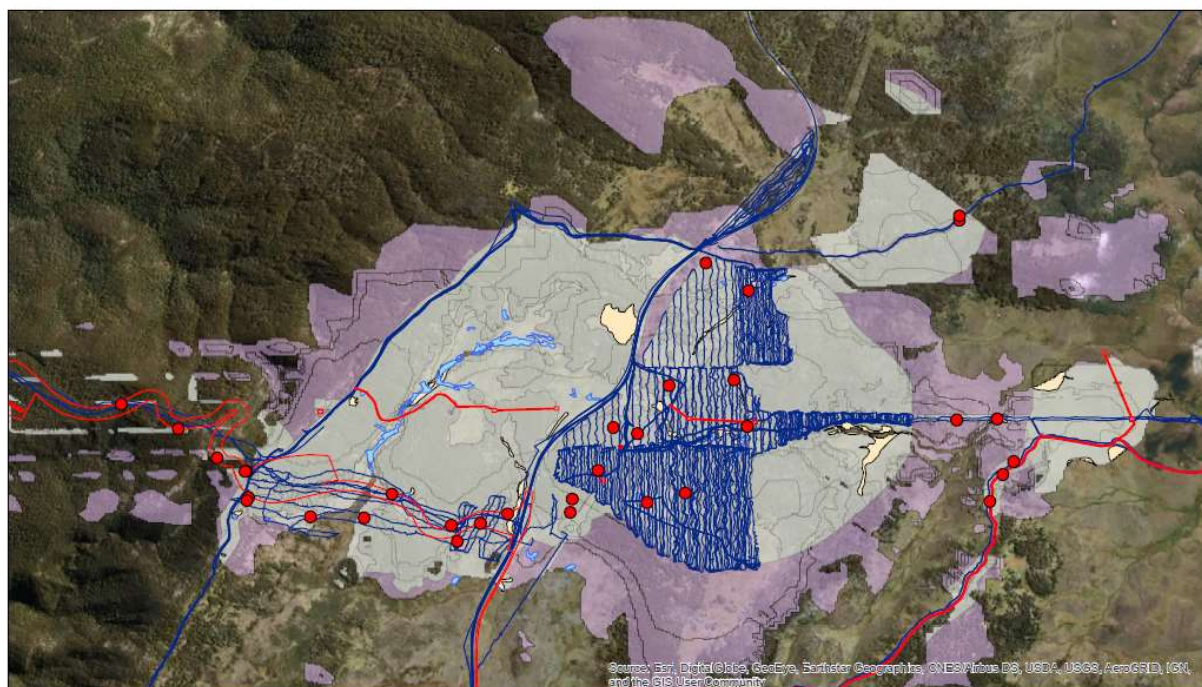
- the total groundwater drawdown area is 2510 ha (purple area, Figure 1).
- the area of groundwater drawdown which has been subject to vegetation mapping is 2,175 ha, or 86% of the total drawdown area. Therefore, there is 335 ha of unmapped vegetation within the drawdown area (purple area, Figure 1).
- of the vegetation that is mapped within the drawdown area (ie the 2,175 ha), there are 48 BAM plots (red points, Figure 1) covering the vegetation zones shown in Table 1. There is a subset that has also been subject to rapid vegetation survey (blue line, Figure 1)
- the total area of obligate groundwater dependent PCTs within the groundwater drawdown footprint is 28.3 ha (cream area, Figure 1). This is comprised of the following PCTs:
 - PCT 1225 – Alpine and sub-alpine peatlands, damp herbfields and fens, South Eastern Highlands Bioregion and Australian Alps Bioregion - **10.8 ha**
 - PCT 637 – Carex - Juncus sedgeland/wet grassland of the South Eastern Highlands Bioregion - **17.55 ha**

- PCT 765 – Sub-alpine grasslands of valley floors, southern South Eastern Highlands Bioregion and Australian Alps Bioregion - **0 ha**
 - This is consistent with the mapping figures presented in the BDAR (pp 453-4)
 - The total area of bogs within the groundwater drawdown footprint based on Hope's mapping is 12.05 ha. This area was not subject to BAM plots or rapid survey by the Proponent.
 - It's clear from the mapping of an overlay of the vegetation mapping within the drawdown area as well as the location of the BAM plots that there are large swathes of vegetation that have not been subject to any survey. Furthermore, the placement of the BAM plots has clearly not been randomly stratified as they are clustered around road access points.
 - Note as well that only small fraction of the drawdown area is considered to be directly impacted (red line, Figure 1). This is as a result of the pipeline

Table 1 – number of BAM plots within vegetation mapping associated with drawdown area

PCT	Condition	Area (m ²)	Area (ha)	No of plots
1191	Derived grassland	1.039206	0.001039	0
	High	12.41234	0.012412	0
1196	Cleared	0.15577	0.000156	0
	High	398.717	0.398717	5
1224	Cleared	0.21833	0.000218	0
	High	521.0071	0.521007	14
	Medium	0	0	0
	Poor	0	0	0
1225	High	19.05869	0.019059	1
	Medium	0	0	0
296	High	3.254004	0.003254	0
	Medium	21.50033	0.0215	0
299	High	23.51395	0.023514	1
300	High	46.47623	0.046476	1
	Medium	1.119844	0.00112	0
302	High	7.462934	0.007463	1
303	High	31.00903	0.031009	2

	Other	6.986168	0.006986	0
311	High	69.35538	0.069355	1
637	High	20.54146	0.020541	2
	Poor	0.0132	1.32E-05	0
639	High	20.1616	0.020162	1
	Other	25.81371	0.025814	0
644	Cleared	0.446328	0.000446	0
	Derived grassland	5.07998	0.00508	1
	High	642.3092	0.642309	16
	Medium	3.029666	0.00303	1
	Other	123.3007	0.123301	1
679	High	2.021145	0.002021	0
	Other	0.009801	9.8E-06	0
729	Derived grassland	1.434607	0.001435	0
	High	26.52115	0.026521	0
	Medium	0.395152	0.000395	0
Total		2034.364	2.034364	48



Legend

- BAM plots within drawdown area
- Impact footprint
- Rapid flora survey transect
- bog & fen mapping (Hope 2012)
- PCTs 1225 & 637 within drawdown area
- Vegetation mapping within groundwater drawdown area
- Groundwater drawdown area

Snowy 2.0 Groundwater drawdown area, vegetation mapping and survey effort

0 0.5 1 2 km
Datum/Projection: GCS GDA 1984



Copyright 2019 Office of Environment and Heritage (OEH).
This map is not guaranteed to be free from error or omission.
OEH and its employees disclaim liability for any act done on the information in the map and any consequences of such acts or omissions.

4: Comments on Alpine She-oak Skink and Broad-toothed Rat Melinda Schroder NPWS

Snowy 2 – Biodiversity Assessment Report -

Alpine She-oak skink assessment

The Alpine she-oak skink is considered 'data deficient' in NSW as part of the Saving our Species program. This species still has several important information gaps which make assessment of the development impacts difficult. The lack of important life history and ecology information such as microhabitat preferences, resting, wintering and breeding.

This species can be difficult to detect (pers comm N.Clemann, D.Hunter, M.Schultz) and detection can be influenced by time of day, season, temperature, cloud cover and the presence of ants.

As stated in the Biodiversity assessment there is no guidelines for survey of this species although concrete tiles have become the preferred option and this technique was used following expert consultation (N.Clemann, D.Hunter). Surveys were undertaken in known suitable habitat for this species.

The major constraint with tiles is ant colonisation. Once ants infest tiles they are no longer used by skinks. The report provides no indication of the number of tiles infested by ants throughout the duration of monitoring. This is important as it could explain why animals were not detected in some localities.

Summary of info from Spatial data – (supplied by EMM 25/07/2019)

I reviewed the tile location/ detection information with the PCT vegetation layer to cross check survey intensity based on vegetation community type.

- 30 Tile grids (25 tiles) + 60 Tile transects (10 tiles):
- PCT 1196 x 18 sites
- PCT 1224 x 60 sites
- PCT 1225 x 6 sites
- PCT 303 x 1
- PCT 644 x 1
- Heavily disturbed x 1
- not in veg mapping area x 3

36 animal detections in the spatial data (24 according to the Biodiversity assessment report?) - all in PCT 1224. However, two animals were detected at an approximate distance of 2 and 10 metres from a heavily disturbed area, 4 animals were detected near PCT 1225 and 2 animals detected close to PCT 1196.

In summary all animals were detected in PCT 1224 but there was a higher number of tile transect/grids were located. There was 1 tile grid and 5 x tile transect in PCT 1225 and whilst animals were not detected in this PCT they were recorded in proximity and have been recorded in this type of habitat in other locations in KNP (pers observations – Nungar Plain). This community should be considered as suitable habitat for this species and included in the BAM credit.

They are known to occur in open woodland (PCT 1196) and there are other records on Bionet from KNP. However, were not detected as part of the surveys but may still occur – perhaps a buffer should be considered where this PCT is adjacent to PCT 1224 and where animals have been detected.

This species has also been detected in areas of modified vegetation (exotic grass). There are records in Bionet of this species occurring on disturbed ski slopes at both Perisher and Smiggins Holes.

Significant Impact criteria assessment –

There is limited information on home range size and movement patterns of this species to suggest the animals will move from their habitat during construction. Movement patterns are also likely to vary seasonally. This species goes into brumation and therefore may be more vulnerable to disturbance during this period.

The upgrade and expansion of road widths may impact on the ability of the species to move or be more vulnerable during periods of movement across disturbed areas.

Given the low rate of detectability it should be assumed that the species could occur in any of the grassland areas and therefore works may impact on more than seven sites.

There are other threats that are occurring in the vicinity of the proposed development such as increasing horse populations. Horses lead to trampling and disturbance to important habitat for this species (DPIE 2011). Whilst populations of this species have been detected at Long Plan, Cooleman and Kiandra increasing horse populations are likely to pose a significant threat. In addition, major weed invasion from Ox-eye daisy and Sweet Vernal grass may also be reducing available suitable habitat for this species. Implying the species has enough habitat in surrounding areas may not be the case given current threats.

Offset – strategies for this species –

- To improve knowledge of the biology and ecology of this species, identify and provide support for further research on life history, home range, microhabitat preferences, breeding, diet, extent of threats, etc.
- Continue monitoring presence/ absence (potentially population) throughout the duration of the project – link it with a broader NPWS monitoring program for this species
- Implement predator control programs to reduce feral cat and fox populations especially in localities where habitat is to be disturbed or modified and animals may be more vulnerable.
- Implementation of effective hygiene and responsive management programs to control weeds in particular those species that have capacity to alter grassland communities, Sweet Vernal Grass, African Love-grass, Ox-eye Daisy, etc.

Please note Table K.9 - Significant impact criteria assessment – Alpine she-oak skink mistakenly refers to Mauve Burr-daisy.

Broad-toothed Rat Assessment

This species is easily detected by the presence of its olive-green scats and runways constructed in grassland and heath. It is widespread in the higher montane, subalpine and alpine areas of Kosciuszko NP however has suffered from major range constriction being once more widespread across south eastern Australia (Happold 2008). The continuing rarity of the species is due in part to a range of threats including preferential predation by the red fox and cat, competition from rabbits and horse, loss of habitat due to infrastructure development, increased fire frequency and intensity and climate change (Green 2002, Schultz *et al* 2019, Schroder *et al*. 2019).

The population in the vicinity of the Snowy Works has already been impacted following fire and the increase in feral horse populations which has impacted on suitable vegetation cover (Schultz *et al*. 2019).

Spatial data information (supplied Miles Boak 21/10/2019)

There were 77 localities identified as having evidence of Broad-toothed Rat. I am not sure from the data provided in the attribute tables how they were detected. I am assuming that it has been a combination of scats and runways/ Elliot trapping, although this is not identified in Survey methods for the species.

If the vegetation cover at localities is enough to allow this species to construct runways then they have capacity to occur in PCT 1225, PCT 1244, PCT 637. The species credits only cover a small portion of their potential habitat.

Significant Impact criteria assessment –

There is a Saving our Species program for this species that identifies infrastructure development, predation and disturbance of habitat from ungulates as major threats.

Major issue is to ensure connectivity of habitat. This species is preferentially targeted by cat and fox. Loss of habitat forces animals to move across disturbed areas making them vulnerable. Potential to build under road culverts in localities where broad toothed rat habitat is separated by disturbance. They have been found to use these (Schroder et al. 2017).

Offset – strategies for this species –

- Continue monitoring presence/ absence throughout the duration of the project – link it with the broader NPWS monitoring program for this species
- Implement predator control programs to reduce feral cat and fox populations especially in localities where habitat is to be disturbed or modified and animals may be more vulnerable. As part of predator programs include predator activity monitoring.
- Implementation of effective hygiene and responsive programs to control of weeds in those species that have capacity to alter grassland communities, Sweet Vernal Grass, African Love-grass, Ox-eye Daisy, etc.
- Where habitat is becoming fragmented or separated by significant road construction (>40m) . Identify localities where populations may benefit from under road culvert crossings. Although these would need to adjoin with intact habitat either side and consider drainage features of the roads.

PCT Reference Guide

PCT -1224 – Dry grassland

PCT – 1225 – Sub-alpine grasslands of valley floors, Southern South Eastern Highlands Bioregion
Fragmentation & habitat connectivity

PCT – 303 Black Sallee Grassy Woodlands – 78.44 ha –

PCT – 644 Alpine snow gum – snow gum shrubby woodland – 116.22 ha –

PCT – 679 Black Sally – Snow Gum Woodlands 0.26ha

PCT – 1196 – Snow gum / mountain gum shrubby open forest 348.14ha

References

- Green, K. (2002). Selective predation on the Broad-toothed Rat *Mastacomys fuscus* (Rodentia: Muridae) by the introduced Red Fox *Vulpes vulpes* (Carnivora: Canidae) in the Snowy Mountains. *Austral Ecology* 27, 353-359.
- Happold, D.C.D (2008). Broad-toothed Rat, *Mastacomys fuscus*. In: The Mammals of Australia. (eds S.Van Dyck and R. Strahan). pp. 589-591. Third Edition. Reed New Holland, Sydney.
- NSW Department of Planning Industry and Environment DPIE (2011) Alpine She-oak skink (*Cyclodomorphus praealtus*) – endangered species listing
<https://www.environment.nsw.gov.au/Topics/Animals-and-plants/Threatened-species/NSW-Threatened-Species-Scientific-Committee/Determinations/Final-determinations/2011-2012/Alpine-She-oak-Skink-Cyclodomorphus-praealtus-endangered-species-listing> [Last Accessed 28 August 2019]
- Schulz, M., Schroder, M., & Green, K. (2019). The occurrence of the Broad-toothed Rat *Mastacomys fuscus* in relation to feral Horse impacts. *Ecological management & restoration*, 20(1), 31-36.
- Schroder, M., & Sato, C. F. (2017). An evaluation of small-mammal use of constructed wildlife crossings in ski resorts. *Wildlife research*, 44(3), 259-268.
- Schroder, M., Broome, L. Watson, K. and Campbell (2019) The diet of the Feral Cat in Australian mountain systems and implications on threatened species, In press, *Wildlife Research*