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RE: DoP and DECC concerns – Moruya East Village

Dear David,

This letter is provided in response to the relevant ecological issues raised by the Department of Planning (DoP) and the Department of Environment and Climate Change (DECC) in their correspondence of 27th July 1008 and 23rd July 2008 respectively.

I have provided a detailed response to their concerns, including a précis and justification of the scientific method used by me to reach my conclusions.

DEPARTMENTAL CONCERNS

DoP is principally concerned with the impact on the endangered ecological community (EEC) Lowland Grassy Woodland (LGW) from the construction of the dementia centre, scattered cottages, part of the residential subdivision and part of the village centre. This is regarded as an unacceptable impact and observed that no mitigation or offset strategy was identified.

The DECC's criticisms and concerns are more detailed and far-reaching, maintaining that the proposal has the potential to impact on three EECs, being LGW, Coastal Saltmarsh and Swamp Oak Floodplain Forest. It claims that the assessment report has underestimated the extent of these three communities due to several areas of "potential" EEC being overlooked.

DECC claims that the areas mapped by Keystone Ecological as 1b - Open Grassland with Scattered trees should be regarded as the EEC and that the proposal will impact on 35 hectares of LGW.

DECC also claims to have applied a "precautionary approach" and determined that the areas shown as 2a – Carex sedgeland and 2b – Juncus sedgeland are all part of the Swamp Oak Floodplain Forest. Further, DECC refers to the absence of impact assessment of the "Constructed wetland open water bodies" in these areas.

DECC believes that the stormwater treatment methods proposed will not protect the sensitive downstream environments of Swamp Oak Floodplain Forest and Coastal Saltmarsh.

RESPONSE

Eco-cabins

The scattered cottages (or "eco-cabins") are to be removed from the woodland in the south eastern corner and this will therefore significantly diminish the potential impact of the development proposal on the LGW.

Extent of Lowland Grassy Woodland

Germane to this discussion is the extent of the LGW and how its presence is determined. DECC claims that the proposal may impact on 35 hectares of this EEC; my survey data and experience of the site indicates that the figure is between 4.8 and 6.6 hectares. The discrepancy is explored in detail below.

Mapping a highly fragmented vegetation community such as LGW is a difficult process and the mapping provided by Keystone Ecological was based on field survey (quadrats for full floristics and transects to determine the extent of vegetation types), interpretation of aerial photography and a synthesis of other mapping projects in the area commissioned by NSW National Parks and Wildlife Service and Eurobodalla Shire Council.

The rules I have applied to my mapping resulted in a recognition of LGW in the south eastern corner (5b) based on its general condition, dominance of native species in the understorey and ground layer, the regeneration observed at the time and the higher density of trees (particularly hollow-bearing trees). This area of 5b covers approximately 4.8 hectares.

Although these features occur to a much lesser degree in the area I have mapped as Open Woodland (5a), I am prepared to accept the argument that this represents a more disturbed type of Woodland (perhaps even regenerating) and therefore extend the LGW on site to the that area, thus expanding its occurrence on site to 6.6 hectares.

I do not agree, however, that the LGW on site covers all of the areas denoted as Open Grassland with scattered trees (1b) - a further 21.9 hectares - as has been suggested by DECC. While I agree that the scientific determination of the NSW Scientific Committee states that this EEC may exist without a tree layer, at some point a decision has to be made – a line has to be drawn – where the EEC (or potential EEC) becomes a cleared grazing paddock. Applying the rules as described in DECC's correspondence would mean that almost every cleared paddock in the Moruya area would be classified as EEC. This is clearly a perversion of the vegetation mapping process, is at odds with the Native Vegetation Management Act, would penalise good farmers that have retained some trees and would not serve a larger conservation agenda.

The rules I have applied here are similar to the ones I have applied across vegetation mapping projects that I have conducted across the state since 1988 for NSW National Parks and Wildlife Service, the Royal Botanic Gardens and other private interests. I bring to this my experience in typifying and mapping similar fragmented landscapes in south western NSW (Pooncarie 1:250,000 map sheet, Riverina grasslands), central western NSW (Forbes 1:250,000 and Cargelligo 1:250,000 map sheets), south eastern NSW (covering the areas known as "the south east forests") and the northern tablelands (Guyra 1:100,000 map sheet).

As vegetation communities usually exist as a continuum, an arbitrary decision has to be made where the line is to be drawn between the vegetation types. The presence of sharp natural boundaries is the exception and so threshold rules must be developed to define these boundaries. Therefore, I refer you particularly to my paper on the Guyra 1:100,000 map sheet (J. S. Benson and E.M. Ashby 2000, *Cunninghamia* volume 6 number 3) where we mapped landscapes on the Northern Tableland very similar to the ones at Moruya. This work was one of the first published NSW vegetation maps based on objective multivariate analysis of robust floristic data and environmental determinants, rather than *a priori* assumptions and subjective interpretation of photo pattern.

The threshold I applied for the Moruya East Village mapping arose from my experience in Guyra and, in this case, was a combination of tree density, dominance by native species, landscape position and disturbance history. As was required for the Guyra work, a judgement as to the pre-European density of the vegetation was assumed (1-2 crown widths apart in the valleys of medium to high nutrient soils as on the subject site) and areas more than 70% cleared were regarded as cleared agricultural land. This is how the areas marked 1a, 1b and 5a were delineated. It is regrettable that this detail was omitted from the assessment report, but like much work that is done routinely over many years, has become assumed background information in my mind.

The NSW Scientific Committee's Final Determination of August 2007 states that "*Either or both of the overstorey and mid-stratum may be absent from the community. Native grasslands derived from clearing of the woodland and forest are also part of this community if they contain characteristic non-woody species listed in paragraph 2*". The quadrat in area 1b was located in that part that was in the best and most natural condition on the distribution of scattered trees and fences (used as a surrogate for grazing intensity) (see Figure 2 of Flora and Fauna Impact Assessment report).

The quadrat in 1b shared only 7 species with that located in the Woodland area (5b), 4 of which are introduced species (*Taraxacum officinale* Dandelion, *Petrorhagia nanteuilii, Oxalis corniculata* Yellow Wood Sorrel and *Plantago lanceolata* Ribwort) and the remaining 3 are widespread grasses (*Themeda australis* Kangaroo Grass, *Austrostipa* sp and *Cynodon dactylon*). Of the 20 species recorded in the quadrat in community 1b, only 10 species are native and of those 10 only 6 are listed in the final determination as non-woody species characteristic of that community. Further inspection reveals these species to be widespread species that occur across a large number of environments local to the Moruya area.

Based on this information, I do not agree that 1b is representative of the woodland EEC as characterised by the final determination or by the example of it on the subject site.

Although dismissed as unnecessary at the time and too complex given the lack of analysis available in the literature, I have also further investigated the data in regards to "species count thresholds" in response to DECC's correspondence.

The dilemma of determining when a disturbed paddock is no longer representative of an EEC has been addressed for woodland and forest communities across the Cumberland Plain (M. Tozer 2003, *Cunninghamia* volume 8 number 1). In this work, "species count thresholds" have been determined so that a data set collected according to a standardised methodology may be attributed to a vegetation community with 95% confidence, based on the numbers of native species AND the numbers of "positive indicator" native species (not "characteristic" species as referred to by the NSW Scientific Committee) observed within a 400 square metre quadrat.

The Moruya data were collected by me according to the required standard. As I was part of the research team that set this standard, I am confident of these data.

Of the communities described in Tozer's study, the closest in species composition and landscape position to that of LGW is Alluvial Woodland. In order to be certain with 95% confidence that a data set may be attributed to Alluvial Woodland, the standardised quadrat must have at least 23 native species observed, with 12 or more being "positive indicator" species. Although a comparable rules set has not been published for the woodlands of the south coast, it is not unreasonable to use the Cumberland Plain woodlands thresholds as a guide.

Indicator species of the vegetation types of the south east have been detailed by D.A. Keith and M. Bedward (1999, *Cunninghamia* volume 6 number 1). In this paper, 40 "diagnostic" species have been listed for Bega Dry Forest (which is now attributable to LGW EEC). The Moruya quadrat in 1b had only 3 species common with this diagnostic list, only one of which is a positive indicator of the community (*Themeda australis*). The second is frequently found in

the community (*Hypericum gramineum*) and the presence of the third (*Angophora floribunda*) is uninformative as it is so commonly found across the landscape. Also, the number of native species observed in the 1b quadrat (n=10) represented a quarter of the native species richness of Bega Dry Grass Forest (n=39 +/-1).

Given the depauperate species list from the 1b quadrat on the subject site, the general absence of positive indicator species for Bega Dry Grass Forest on the subject site, the lack of overlap in species between the 1b area and the 5b LGW area on the subject site, the poor number of species "characteristic" of LGW in the 1b data, it is highly unlikely that any species threshold rules developed for LGW *sensu* Tozer (2003) would infer with 95% confidence that the 1b area is LGW.

Moreover, the relative cover abundance data for the 1b quadrat indicate that the site was dominated by the introduced grass *Briza maxima*, covering at least 75% of the site at the time of survey. This species is often associated with highly degraded land (A. Muyt 2001, *Bush Invaders of South-east Australia*).

Therefore I reaffirm my contention that although LGW may have once occurred on the slopes and rises across the site, it is now restricted to the areas shown as 5b and 5a in the south eastern corner, due to past clearing, continued grazing, the presence of feral animals and weed infestations. The area delineated as 1b remains, in my opinion and based on the logic and data provided above, cleared derived exotic grassland that no longer possesses enough characteristics to assign it as a form of LGW.

Extent of Swamp Oak Floodplain Forest

The extent of the Swamp Oak Floodplain Forest (SOFF) on the subject site was determined by me using a similar methodology to that described above for LGW (full floristic quadrats, transects for determination of extent and synthesis of other relevant vegetation mapping).

From these data, there is no firm evidence to suggest that the SWOFF should occur along the drainage line in the absence of grazing. Cattle are naturally absent from the areas dominated by *Juncus acutus* and there was no evidence of typical, characteristic or diagnostic SWOFF species in these areas.

Moreover, recent vegetation mapping undertaken on behalf of Eurobodalla Shire Council has confirmed the extent of this community on site as per that depicted in my report.

The extension of SWOFF on the site vegetation mapping is not "precautionary" as claimed by DECC; it is simply incorrect.

Impact on sensitive downstream environments

DECC indicates that the proposal includes dams or constructed wetlands to occur within the drainage lines and indicate that this is an unacceptable solution given the potential damage such structures may inflict on adjacent Coastal Saltmarsh and SWOFF.

This interpretation does not accord with my understanding of the activities to be carried out in these areas. It is proposed that shallow excavations occur in the areas dominated by *Juncus acutus* so that the roots and the majority of the weedy soil seed bank are removed. These shallow depressions will then be reinstated with appropriate native species, creating small ephemeral wetlands that will maintain the hydrological functioning of these lowland areas.

No construction will occur in these areas; activities will be limited to restorative actions only.

The development proposal does not impinge on these areas, being below the modelled flood line and hydrological modelling indicates that the quantity and quality of water delivered post development will at least be equivalent to the pre-development situation.

Mitigative measures and offsets

Despite claims to the contrary, the proposal does in fact contain mitigation and offset strategies. Principal among these is the retention of the vast majority of the extent of the areas of highest quality (5b). Areas with high regenerative potential (5a) are also to be set aside as a vegetated corridor and other degraded areas that probably once supported Lowland Grassy Woodland lie outside of the development area and are available for conservation management. Other mitigative works include the erection of a considerable number of nest boxes to compensate for the inevitable loss of hollows as the older hollow-bearing trees further senesce, die and fall over.

Approximate figures of the losses and gains for the development footprint are:

- Lose 1.4 hectares of Lowland Grassy Woodland (5b)
- Lose 0.9 hectares of regenerating Lowland Grassy Woodland (5a)
- Retain 3.4 hectares Lowland Grassy Woodland (5b)
- Retain 0.9 hectares regenerating Lowland Grassy Woodland (5a)
- Rehabilitate 3.7 hectares of Open Grassland (1a) for the restoration of Lowland Grassy Woodland
- Rehabilitate 2.64 hectares of Open Grassland with scattered trees (1b) for the restoration of Lowland Grassy Woodland

Thus, for the loss of 2.3 hectares of LGW EEC, the proposal provides the opportunity to retain and manage 4.3 hectares and restore a further 6.34 hectares, thus providing a total on-site offset of 4.6:1.

The areas to be retained are also strategically located so that they are contiguous with other occurrences of this vegetation on adjacent properties. The rehabilitation sites are also located so that they may provide stepping stones for wildlife movements across the site and beyond to the north west and south west.

The areas of LGW on site are generally in poor condition, with uncontrolled grazing by cattle, presence of feral animals and large occurrences of weed infestations. The proposal will allow for these key threatening processes to be controlled and the degradation reversed.

SUMMARY

The vegetation mapping on site has been conducted using best practice methodology by an experienced practitioner.

The extent of Lowland Grassy Woodland on site is restricted to the south eastern corner and incorporates the areas shown as 5a and 5b.

The areas of Lowland Grassy Woodland to be impacted on are small and are located at the bottom of the slope at the interface with cleared open grassland.

The eco-cabins that were originally proposed to occur within the Lowland Grassy Woodland have been removed from the proposal, thus allowing for the vast majority of the EEC in the best condition to be protected in its entirety.

While the area that this vegetation type occupies in the local area is unknown to me, it is known that the Moruya area is a stronghold for this community. Also, the extent of all EECs in the LGA has been the subject of recent mapping by Eurobodalla Shire Council and this mapping shows the Lowland Grassy Woodland occurring across many parts of the LGA. The area to be impacted upon on the subject site is very small in this context.

Most of the extent of Lowland Grassy Woodland on the site will be retained. The loss of 2.3 hectares is offset by the retention of 4.3 hectares and the rehabilitation of 6.34 hectares, providing an offset ratio of 4.6:1.

Swamp Oak Floodplain Forest on site is restricted to that area shown in the Flora and Fauna Impact Assessment.

The fear that DECC expressed regarding constructed features within the drainage lines and their potential impact on the sensitive downstream environments is unfounded as no such features are part of the proposal.

I hope that this information is satisfactory and addresses all of the relevant issues. Please do not hesitate to contact me if any further clarification or investigation is necessary.

Elizabeth Ashby

Principal Consultant
Keystone Ecological