

SUBMISSION ON MIGHTY RIVER POWER LTD APPLICATIONS FOR RESOURCE CONSENT

Section 145 of the Resource Management Act 1991

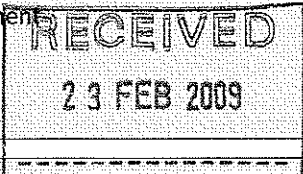
To: Freepost Call In
Ministry for the Environment
PO Box 10362
The Terrace
Wellington 6143

OR

Email: turiteacallin@mfe.govt.nz

Fax: 04 439 7705

[Note: If you are emailing or faxing your submission, please mark in the subject line: 'Turitea Call In']



This submission relates to the applications for resource consent lodged by Mighty River Power Ltd for the Turitea Wind Farm proposal as identified on the next page.

Closing Date and time for submissions: 5.00 pm Monday 23 February 2009

Title: Mr Mrs Miss Ms (Please circle the appropriate title(s) or print clearly below)

My/Our Full Name(s): Dr Gillian Lucy Rapson

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Please tick the relevant boxes on the next page to identify whether you are making a submission on all applications for resource consent or just some of them (please identify).

Please also indicate on the back of this form (✓) whether you support, oppose, or are neutral in relation to the applications. If you are making a submission only on parts of an application for resource consent, please note this when specifying the reasons for your submission.

The reasons for my/our submission are:

If you are attaching further information tick for yes Further info attached

Any development, other than the minimum required to provide some public access to the area, is not an appropriate use of a nature reserve.
In any case, the consent application has not adequately clarified the nature of the vegetation type which will receive the severest impact, and their proposed mitigation procedures seem naive.
I am not *per se* opposed to windfarms on private land, as long as they are not within 2 km of a reserve, although I dislike their impact on the landscape.

Please use more pages if you need to.

I/we seek the following decision from the Board of Inquiry (provide precise details including the nature of any conditions sought):

Please use more pages if you need to.

Rejection of all resource consent applications as listed overleaf, in particular those which affect the Turitea Reserve or are for turbines within 2km of the reserve.

Use a clear tick in the appropriate box below (✓)

I/we wish to be heard in respect of my/our submission (to speak at the public hearing).

I/we DO NOT wish to be heard and hereby make my/our submission in writing only

Signature(s):

Date: 20 February 2009

(Signature of submitter, or person authorised to sign on their behalf is required. Note signature is not required for electronic (email) submissions. If this is a joint submission by two or more individuals, each individual's signature is required.)

Use the tick boxes below to indicate the called-in applications for resource consent that your submission concerns. Use a clear tick in the appropriate box or boxes (✓).

I/we make my/our submission concerning all applications for resource consent below

OR My/our submission only concerns the applications for resource consent that I/we have ticked below:

	Support	Oppose	Neutral
Manawatu-Wanganui (Horizons) Regional Council – Land-use Consents			
104553: for vegetation clearance and land disturbance in rare or threatened habitats, near streams and on highly erodible land throughout the general wind farm site.		✓	
104554: for the construction of a double culvert in an un-named tributary of the Kahuterawa Stream as shown on the included map.		✓	
Manawatu-Wanganui (Horizons) Regional Council – Discharge Permits			
104555: for the discharge of dust to air from the concrete batching plants to be located as generally shown on the included map.		✓	
104556: for the discharge of dust to air from the mobile crushing plant throughout the general wind farm site.		✓	
104557: for the discharge of wastewater from two operations and maintenance facilities to land to be located as generally shown on the included map.		✓	
104558: for the discharge of stormwater from substations to land to be located as generally shown on the included map.		✓	
104559: for the discharge of cleanfill to land in the form of spoil disposal sites throughout the general wind farm site.		✓	
104560: for the discharge of stormwater from roads, turbine platforms and other areas to land.		✓	
Palmerston North City Council – Land-use Consents			
RC0068 <ul style="list-style-type: none"> •to establish and operate a wind farm in the areas within the Palmerston North city jurisdiction as generally shown on the included map •to undertake earthworks associated with tracking and roading, turbine construction and associated buildings in the areas within the Palmerston North city jurisdiction as generally shown on the included map •for the western side of Pahiatua Aokautere Road not meeting access requirements at the location shown on the included map •for the storage of diesel (10,000 L) in bunded areas outside the Turitea water supply catchment, generally located at the two substation laydown-areas shown on the included map, that exceeds the 0.2 effects ratio maximum in the rural zone •for the construction of a 220 kV electricity transmission line and substations as shown on the included map. 		✓ ✓ ✓ ✓ ✓	
Taranua District Council – Land-use Consents			
1448: <ul style="list-style-type: none"> •for a wind farm (which is not listed as a permitted or controlled activity) in the areas within the Taranua District as generally shown on the included map •for land disturbance of more than 200 m² of soil and cleanfill material associated with tracking and roading, turbine construction, spoil disposal and other associated works in the areas within the Taranua District as generally shown on the included map •for upgrades to South Range Road and the construction of new site access at the location shown on the included map •for turbine and wind monitoring mast structures not meeting height requirements within the Taranua District •for the modification of a Significant Natural Feature in Schedule 3.3 (ie, Taranua Ranges Ridgeline) •for not meeting noise requirements •for clearance of indigenous vegetation in the areas within the Taranua District as generally shown on the included map. 		✓ ✓ ✓ ✓ ✓ ✓ ✓	

NOTE: A copy of this submission form MUST also be sent to Mighty River Power Ltd at:
 Freepost – MRP Mighty River Power Ltd PO Box 445 Hamilton 3240 Attention: Stephanie Froggatt
 Or email turitea@mightyriver.co.nz or fax (07) 857 0192



I/we have sent a copy of my/our submission to Mighty River Power Ltd as per Section 96(4) of the RMA.

Submission opposing granting of resource consents for a windfarm as proposed by Mighty river Power Ltd, in and around the Turitea Reserve, Manawatu

February 20 2009

By Gillian Lucy Rapson, 28 Parkland Crescent, Palmerston North.

Apart from some general comments on the reservation of vegetation in reserves, and landscape issues (which of course, include vegetation issues), I confine my comments to the **terrestrial plant ecological aspects** of the proposed windfarm development. I do so because in those aspects:

- I have three decades of experience as a plant ecologist, including over 2 decades as lecturer and senior lecturer in Plant Ecology at Massey University;
- I have several years' experience in ecological restoration in my work with the CT Keeble Memorial Forest Trust, and more latterly, with various areas of the sand country; and
- I have considerable familiarity with the Manawatu vegetation and landscape.

Documents I refer to are:

- *AEE*, i.e. the *Turitea wind farm: Resource consent applications and assessment of environmental effects*, a document from Might River Power, August 2008, and
- *EA*, i.e. *Ecological Assessment of the proposed Turitea windfarm, Palmerston North*, by Wildlands Consultants, July 2008, which is Appendix D of the *AEE*, and so is also included in reference to that.

Additionally MRP is used as an abbreviation for Mighty River Power Ltd.

Summary of my position

I am opposed to granting of the consents applied for because:

- Turbines are **inappropriate** in or near a nature reserve, especially one of this degree of local importance.
- There is **insufficient information** in the *EA* to accurately assess the impact of the proposed construction on the vegetation type most affected (Horopito forest and scrub).
- There are so many inconsistencies in the *EA* that even the area of the vegetation type which would be affected is **unknown**.
- The affected vegetation is a seral stage, which is undergoing regeneration, and so is especially **valuable**, even more so if it is >1 century old, and relatively weed-free.
- Because of the extremely slowness of regeneration on that site, vegetation will be extremely **difficult to "restore"**.
- The proposed "restoration" and mitigation strategies are **optimistic** at best.
- There is no assessment of exposure to exotic species' **invasions** as a consequence of infrastructural activities within the reserve.
- There is no apparent provision for the **disestablishment** of any infrastructure on the site when its usefulness has terminated, and for the consequent restoration required.
- The **visual impact** from Palmerston North and from within the Turitea reserve would be unacceptably severe.

Impacts of turbines on vegetation types in the reserve

It is axiomatic that a windfarm would be placed on the more exposed portions of a landscape, and that therefore the **vegetation of those exposed portions** would be the most affected. But the *EA* does not contain a reliable assessment of the extent of that effect for the Turitea Reserve. Nevertheless I have calculated a partial one, for the northern section of the reserve, based on the information in Fig 4a of the *EA*. It would be appropriate to be able to present these figures for the entire reserve, or even the rest of the affected area of the reserve, but since Fig 4b of the *EA* does not contain the promised (see pg 15, first line) second detailed vegetation map of the southern portion, that is impossible, given my resources.

The approach I took was to calculate the approximate area of each vegetation type (excluding pasture of which only about 13 ha are present in this part of the reserve), and then the number of turbines which MR proposes to place there. This clearly shows (Table 1) that the vegetation type **Horopito Forest and Scrub forms only 8%** of this part of the reserve, but will contain **nearly 48% of the turbines**, with other vegetation types, except for Plantation (of exotic species), only minimally affected. The Horopito forest and scrub will host 1 turbine for every 10 hectares in this part of the reserve, a higher density of turbines than any other vegetation type.

Vegetation type	Area of vegetation type / ha	Proportion of vegetation type in measured area	Turbine no. in each vegetation type	Number of turbines / 10 ha of vegetation type	Proportion of turbines in each vegetation type
Mosaic of rimu/tawa forest	588.7	0.436	0	0.00	0.00
Secondary broadleaved forest	341.5	0.253	0	0.00	0.00
Plantation	174.1	0.129	11	0.63	0.48
Horopito forest and scrub	107.6	0.080	11	1.02	0.48
(Sparse emergent podocarps) / mixed secondary forest	95.7	0.071	1	0.10	0.04
Water/Dam	28.7	0.021	0	0.00	0.00
Indigenous shrub / rank grasses	8.0	0.006	0	0.00	0.00
Toetoe/ <i>Chionochloa</i> tussockland	6.6	0.005	0	0.00	0.00
	1351.0		23		1.00

Note that in *EA*, Section 5.3, pg 15, it is stated that "Horopito forest and scrub covers the largest part of the reserve (c. 1,100 ha), including most of the main ridge". It is hard to reconcile this statement with the analysis above, even in proportionate terms, unless *EA* has included the category of Secondary broadleaved forest in with Horopito forest and scrub. But in Fig. 3a it refers to this combined vegetation type as "Indigenous secondary forest and scrub", not Horopito forest and scrub. Additionally the text on pg 15 goes on to refer to "Secondary broadleaved forest" as a separate entity from the Horopito forest and scrub. Thus I remain confused as to the **extent of this vegetation type** in the reserve. This is a critical issue, since it affects the proportion of the vegetation type which it is proposed to impact on.

Given the AEE's assessment that 25 ha of the reserve will be cleared, and that 11/66 turbines will be hosted in the 107 ha of Horopito vegetation type in this northern portion of the reserve, then, on average, 4.2 hectares of that vegetation type will be cleared ($25 \times (11/66) = 4.2$). This equates to almost **4% of this vegetation type**, already a small one in the reserve, which MRP proposes to clear.

To put this clearance rate into perspective, a hectare = 10 000 square metres (m²). The average Palmerston North housing section is about 700 m², so that there are 14.28 housing sections per hectare. Thus **4.2 hectares = 60 housing sections**, which is an extremely large subdivision. It is hard to see that such a loss level could ever be acceptable in a vegetation type, especially a small one. The housing section equivalent for the cleared area of the reserve as a whole is 357 sections. Any proposal to use any reserve for such a "subdivision" or even for a much smaller one, would, I believe, be deemed an unacceptable use of a reserve by most ratepayers.

However, this situation, which seems clear from the analysis above, is in **conflict** with the statement in the EA (pg 32. paragraph 5), that "[c]learance of 25 ha of horopito-dominant forest and scrub is a loss of approximately 1.6% of this vegetation type from the Reserve". Working backwards, this implies that the area of horopito vegetation is 1562 ha, which conflicts with both the statement in EA, pg 15, referred to above (1100ha), and the probable rough coverage calculated in Table 1 above (multiplying the proportion of horopito vegetation (0.08) in the area of reserve measured, by the total area of the reserve (3500ha)), of 280 ha. Alternatively, given that there are more turbines in the southern portion of the reserve, then, using the turbine density figure above, of about 10 ha per turbine, then 66 turbines should occupy about 660 ha. The confusion continues. It is regrettable that the EA cannot give a credible figure for the area of the vegetation type most affected, as this makes it **difficult to assess the impact** of the clearances. But it appears that clearance will directly impact on somewhere between 2 and 4 % of the Horopito forest and scrub.

Expendability of Horopito forest and scrub vegetation type

The AEE proposes the placement of turbines mainly in the Horopito Forest and Scrub vegetation type, and the clearance of 25 ha of this vegetation for turbine sites. However, this is **not an expendable vegetation type**, with minimal ecological merit. This is a small, but very important community, which probably has a high number of different species.

Although there is a description of the Horopito forest and scrub vegetation type on pg 19 of EA (subsection 2.3 of section 5.4), there is (despite the "considerable amount of time .. spent, in the field.."; pg 12) **no quantification of the abundance** of the various species which make up this vegetation type. This is extremely regrettable, as it does not allow a clear idea of the vegetation to be formed. Considering that the existing access road runs through much of this vegetation type, it should have been the work of a few hours to produce some subjective estimates of abundance or cover for all species present. For example, the vegetation as described seems very species' poor, and it is unclear how many of the species listed in Appendix 1 actually occur in this vegetation type. Given this lack of real information it is not possible to fully assess the impact of the proposed development on the Horopito vegetation type. This hardly seems adequate.

Additionally, much of the reserve's **species' diversity** of grassland, herbland and shrubland species is probably included in this vegetation type, where the diversity is

probably as high, if not higher, than in most other vegetation types of the reserve. In many cases, the Horopito forest and scrub vegetation type probably represent the only occurrence of such species in the reserve. For example, this vegetation type almost certainly includes the mountain cabbage tree, *Cordyline indivisa*, and the grass tree, *Dracophyllum* sp. (aff. *filifolium*). The location in the reserve of the *Pittosporum cornifolium*, a very rare species locally, is unknown.

The Turitea Reserve and the Horopito vegetation type is undergoing **slow regeneration** subsequent to the fires at the end of the nineteenth century, release of deer at the start of the twentieth century, and the 1936 gale which damaged much of the remaining native vegetation around the Manawatu. This sequence of events apparently culminated in forest collapse in the Turitea Reserve. The current regeneration pulse may date back to a period of forest collapse around 1955, so that the vegetation proposed for clearance may be 60 years old. However, some of the horopito trees appear to be 3-6 m tall, so it is also possible that the vegetation is closer to 110 years old. It would be relevant to know the maximum age of the horopito on the areas proposed for clearance. It would be especially interesting to know the age, health and size of the emergent miro referred to as present in that vegetation type (EA, pg 19). In the EA there was no apparent attempt to **age the horopito trees** or others, using dendrochronology. Thus it is hard to assess the impact of clearance of such vegetation.

Clearance of part of this vegetation will inevitably delay plant community development (called "succession") by 60-100 years, and probably longer. In addition, given the windiness of the site, the disturbance required by turbine replacement may simply open up and cause collapse of the adjacent, currently unaffected areas of horopito forest and scrub, which will delay regeneration even longer, or possibly prevent it altogether. A second disturbance event (which is what turbine establishment would be) will decrease the capacity of the vegetation to recover, slowing the already slow rate of succession around those sites. Therefore it may take 100-200 years to reach the same sort of vegetation on the "restored" areas as is intended to be cleared by MRP. Additionally, **regeneration on the turbine sites**, when they are eventually disestablished, will be even slower, because of damage to soils, and decline over time in seedbanks in the soil, as well as reduction in the availability of suitable secondary successional species in the local flora.

Significance of the Turitea Reserve

The EA states (pg 29, Section 7.1) states that "clearance of 25 ha ... equates to approximately 0.048% of the Ecological District". The EA also states (pg 29, Section 7.1) that "[w]ithin Palmerston North District, indigenous vegetation covers approximately 4,500 ha, or 12-15% of the District". While these positions are true, they are also deeply misleading.

The Manawatu Gorge ED is the most heavily vegetated of the districts around Palmerston North; inevitably and unsurprisingly the proportion of vegetation affected is relatively low. Nevertheless, most people would consider the proportion of natural vegetation within the Ecological District to be cleared as the relevant figure, not the proportion of the district. This figure was not given in the EA, and is likely to be several times higher than the 0.048% quoted above.

Presumably Palmerston North District is not an ecological subdivision, but a political one. But the average (apolitical) Palmerstonian would view his/her habitat-containing zone as a

strip, sweep or sequence which extends from the sea to the ranges. This would include what ecologists would categorise as the Foxton ED, and the Manawatu Plains ED, which have **natural areas covering 1.9% and effectively 1.3%** respectively (from the relevant PNA reports). In addition, the average Palmerstonian would flow on his interest from the lowlands and into the mid-altitudes of the Manawatu Gorge South ED, especially those areas visible from the lowlands. Given the paucity of natural vegetation which an informed Palmerstonian would see in the lowlands, greater emphasis would then be placed on the protection of natural vegetation in areas where it is more common, such as the Manawatu Gorge South ED. It would be unacceptable to most Palmerstonians that the major remaining piece of natural vegetation within relatively easy access of their major urban area, Palmerston North, should be "crowned" by a wave of turbines, and at the expense of the natural vegetation which is part of their habitat-contact zone.

The reason that we have so little lowland vegetation left now is because of past "developments", which have "eaten" away at the increasingly small remnants and reserves to the point where many have simply collapsed. As reserves become smaller and more disturbed, they become **increasingly vulnerable to disturbances** by human activities. In addition they become increasingly vulnerable to natural disturbances, so those disturbances are more severe and take the vegetation longer to recover from. This occurs because episodes such as windstorms or drought impact more severely when reserves are small, have extensive edge to area ratios (i.e. lots of boundaries with exposed vegetation margins), and are not contained in a matrix of other natural vegetation, parts of which remain unaffected by any particular disturbance. The same applies to vegetation in very exposed sites, such as the Turitea ridge lines, where succession rates are very low. The current proposal is yet another "development" which will **gnaw away** at our natural heritage, particularly that of the lower altitudes (<800m). It will not be the last.

The proportion of lowland New Zealand and lowland Manawatu in native vegetation is now so small that what remains must be preserved at all costs. Times have moved on from the attitude of the pioneer settlers, to the modern era where people increasingly search for the **environmental sustainability** which will become an essential. Indeed this is a major plank of the AEE's proposal. Increasingly, though, the notion that any level of disturbance and/or destruction of one of the last remnants of forest in this region is acceptable is becoming out-moded, and our descendents would look at a windfarm in a reserve and wonder at our chronic selfishness, especially given the era in which the proposal was made.

The clearance and modification of even small areas of land (50 ha in Table 5, 57 ha in Table 7 of the EA) is to be avoided. Although MRP states that some damage and loss must be accepted as a part of economic development, that seems an **untenable position** in this day and age, where the planet we live on is in the early to medium stages of ecological collapse, and where we are constantly reassessing our activities in the light of their impacts on the planet and its health. A requirement that all "developments", especially those for financial gain, show a positive outcome for the environment through all of their activities and impacts will become an ecological necessity, and that time is not far away.

It can be seen, with hindsight, that the decision by the Palmerston North City Council to allow **"sustainable energy generation"** within reserves was a mistake. As such, the PNCC should be able to rescind consent (after all, even the president of the USA is able to admit he **"screwed up"**), and resume its policy of protection. Otherwise, they could find that proposals to log the reserve for timber are next presented to them. Timber, after all, is

a sustainable energy source, as sustainable as wind, but just on a longer time scale than most, with the advantage that less infrastructure is required to harvest it (though the relative carbon costs are unclear). Thus sustainable energy generation of any type is not an appropriate use of a reserve.

MRP argues that the funding allocated to the Palmerston North City Council as part of its disbursement of profits from the windfarm, can be used to improve and maintain the Turitea Reserve. The issue then becomes whether an area which has improved weed and pest control, along with decreased quality of significant ridgeline vegetation is better ecologically than one without. This depends greatly on whether a reserve is what is wanted here, or whether an "Ecopark" is considered adequate. The Ecopark concept is supported by the AEE as a reason for allowing disturbance to the Turitea Reserve. But this is simply another disturbance event to add to the reserve, in addition to the turbines etc. Indeed the term "**ecopark**" is **oxymoronic**; either an area is preserved for its ecological processes or it is a park (i.e. effectively a large unkempt garden). The two are not compatible. No reserve is in any way improved by the addition of off-road adventures or of horse-riding etc. All these activities simply increase the disturbance levels in a reserve, and decrease its ecological values, perhaps not immediately, but always inevitably. There is a balance point at which small levels of disturbance are effectively manageable, such as sparse walking tracks, but other activities which increase the transport of weeds into the reserve and otherwise disrupt its natural ecological processes should be unacceptable. I firmly believe that reserves are essential and should all receive the **greatest protection possible** under New Zealand and international law.

Comments on restoration proposals

No evidence is presented to support the claim of the AEE (pg 97, last para.) that site rehabilitation will be "**achievable**." Indeed I know of little restoration work which has been carried out at such an altitude, and none in a comparable vegetation type. Tussock grassland was "restored" alongside the Remarkables' skifield road, near Queenstown, using "direct transfer" techniques among others, with some patches successful, but most not. Direct transfer was also used on the Stockton Plateau, Westport, but its success was very limited, although the transferred vegetation looked good for the first year or two while most of it died. Road margins have been "restored" along the Turoa skifield road, Mt Ruapehu, with manuka slash working relatively well, but the most common feature of these plantings today is the remnants of netting used to hold in mulch.

The EA states: "Initial revegetation works should focus on fast-growing and fast-spreading plants that will achieve a rapid ground cover .. yet will not cause difficulties for establishment of secondary vegetation" (pg 44). Unfortunately there is no research or trial work known to me which identifies what those species might be. Browntop (*Agrostis capillaris*) is proposed as a cover (pg 44), but there is increasing awareness that this species is an aggressive sward-forming grass, even into the alpine zone. Thus it might be very difficult to establish other species into such a sward, and will certainly be the work of decades.

The advantage of direct transfer (p45) is that soil invertebrates and seed is also transferred, some small portion of which survive to, and then at, the new destination. Nevertheless, our extremely limited experience with this technique suggests direct transfer of horopito shrubland will result in death of all or most of the shrubs. This is simply a **short-term cosmetic** approach.

Establishment of vegetation in such an environment will be extremely difficult, and it could well take decades to even put a vegetative cover over the land. In all probability MRP will have moved on from Turitea then, and left the problem to the locals, as has happened with the Golden Cross Mine and other mines on the Coromandel. Thus their statement (EA, pg 49), that a "comprehensive mitigation package has been developed, which when implemented, will **adequately mitigate** such effects" is unsubstantiated optimism.

Restoration is not a fix-all. It merely returns a vegetation cover to an area, which cover bears some resemblance to the previous vegetation type. This is done by direct inplanting, or by establishment of a nurse crop, under which natives can be planted. The long-term goal is that native species will spread naturally (by seed or vegetative reproduction) into the area, and management can then be restricted to weed control. However, there is no evidence at all in the scientific literature that restored vegetation functions in the same way, or even a similar way to undisturbed natural vegetation. Indeed, restoration plantings in New Zealand are all too new to be able to undertake such work convincingly, the oldest in the country being in Palmerston North, and aged 53 years. Nevertheless, the hope remains that restored vegetation will eventually become indistinguishable from natural vegetation, perhaps over a scale of centuries, and indeed, in many cases it is now the best we have available. In this age and time, though, to remove existing natural vegetation though, to replace it with "restored" vegetation, is unacceptable and an instance of deliberate ecological degradation

The biggest problem is likely to be cleaning up in 2-4 decades' time, once the wind farm is removed. It will be especially difficult to **remove the concrete pads**, and other infrastructure of the windfarm, and an even more major job to "restore" the vegetation afterwards, especially considering that MRP might not longer be around to help. A **bond** to cover this work would need to be lodged as part of the commencement of any such "development". The bond would have to include an inflation component, and sufficient capital to use environmentally appropriate approaches (which will only become more stringent as time passes), and then to fund the restoration of the site to the standards then prevailing (which will only become more stringent as time passes). Thus the bond could be expected to be in the order of **many millions of dollars**.

Exotic plant species and weed invasions.

The **list of exotic species** contained in the EA as Appendix 1 contains only 39 species. This seems extremely small, given the diversity of the areas of the Turitea Reserve covered, the presence of exotic pasture in at least some parts of the reserve, and the presence of a roadway along a dry and exposed ridge line. For example, there are some notable absences from Appendix 1, such as foxglove (*Digitalis purpurea*), old man's beard (*Clematis vitalba*), hawksbeard (*Crepis capillaris*) and mouse-eared hawkweed (*Hieracium pilosella*), which I would expect to find in such an area.

This is unfortunate, as exotic species present on a site usually form the nucleus of **future weed problems**. The EA does not adequately cover this issue. Yet the proposed disturbance of vegetation will greatly increase the vulnerability of the reserve to spread of such species. In particular the spreading of topsoil (if there is any), and mulching, hydroseeding and vehicle movements will all increase exposure to weeds, not all of which will be containable.

Landscape issues

Turbines have a huge visual impact, and on the big scale, the spectacle of turbines over, above, or around natural areas, greatly detracts from those areas. For example, a small number of turbines tower over the vegetation of the Manawatu Gorge, spoiling the vistas within the gorge. Some of this is xenophobia, since humans tolerate both train lines and roadways within the gorge, but these tend to all be at very low level, topographically. The effect of towering turbines, which get between the natural bush and the natural sky, is more **visually disturbing**. In addition, constant motion, a plus for wind generation, draws the eye, increasing the visual impact of turbines. This sort of distraction from the delights of natural vegetation is best dealt with by keeping turbines away from the boundaries of reserves. I propose a distance of 2km, given the height of modern turbines; this makes their **height to distance ratio** <0.1 , a ratio at which their visual impact is lessened. Consequently I would urge that no turbines be permitted within this distance from any reserve.

Species list corrections - Appendix 1 of EA

There are some errors / issues in the list of plant species given in EA as Appendix 1. This does not inspire confidence in the rest of the vegetation assessment. The habit of depositing voucher specimens in an established herbarium (such as MPN at Massey University) would allow such identifications to be checked. This should be a requirement of all large-scale resource consent applications.

Acetosa acetosella (pg 63, middle) - *Nga Tipu*, the Landcare plant names database, gives the preferred name of this taxon as *Rumex acetosella*.

Crepidomanes venosum - *Nga Tipu* continues to use the name *Trichomanes venosum*, although the actual taxonomy is in doubt.

Epilobium ciliatum (pg 63, middle). This record is not impossible, but given the remoteness of the habitat, its probable dryness (not that we know which vegetation types these species are recorded in), and the paucity of other exotics, I would suspect it may be a native taxon.

Hypochoeris radicata (pg 63, middle of page) - should be *Hypochaeris radicata*.

Isolepis sulcatus (pg 60, bottom of page) - this taxon, which should be spelt *Isolepis sulcata*, appears to be duplicated under the more accepted name *Isolepis distigmatosa*.

Melicytus lanceolatus - I am surprised at the absence of this taxon.

Rytidosperma penicellata (pg 60) - should be *Rytidosperma penicillatum*.

Wahlenbergia sp (pg 63, bottom). Though it is recorded in the Exotic species list, this genus has a southern hemisphere distribution, but no species are known to be naturalised in New Zealand (see Vol IV, *Flora of NZ*). This, assuming it is a *Wahlenbergia* at all, is probably a native harebell, probably *Wahlenbergia gracilis* or possibly *Wahlenbergia pygmaea*.

Although not a vascular plant, there is sure to be some *Dawsonia superba* in the reserve, and as the world's largest moss, it has a claim to recognition here.