

EVIDENCE IN CHIEF OF MURRAY TONKS - INDEX

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BOARD OF INQUIRY  
HAUAURU MA RAKI WIND FARM PROPOSAL

In the Matter of the Resource Management Act 1991

And

In the matter of resource consent applications by Contact Wind Limited in respect of the Hauāuru mā raki Wind Farm Proposal

And

In the matter of notices of requirement and a resource consent application by Contact Energy Limited for transmission infrastructure related to the Hauāuru mā raki Wind Farm Proposal

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BRIEF OF EVIDENCE IN CHIEF OF MURRAY JOHN TONKS

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## INTRODUCTION

1. My name is Murray John Tonks. I am a Director and Senior Consultant with Environmental Management Services Limited in Napier. My principal qualification is a Masters degree in Regional and Resource Planning from the University of Otago (1989). I also hold a Bachelor of Science degree in Geography and Post Graduate Diploma in Science in Geography from the University of Otago (1984 & 1985). I have 19 years experience in Environmental Management and Planning. Some of the projects that I have worked on during that time include:
  - (a) Investigative studies for hydro development on the Lower Clutha (1991) focussing on impacts of potential land inundation;
  - (b) Transmission line corridor investigations (1995) and investigations for potential effects of hydro developments on land use (1995/96) in the Upper Clutha Valley;
  - (c) Assessment of impacts of proposed Upper Clutha hydro development on recreation opportunity (1995/96).
  - (d) Environmental Impact Assessments for the Kamojang geothermal power plant expansion project (Indonesia, 1996-97);
  - (e) Transfund research (2002), focussing on post-construction review of construction-related consent conditions for state highway roading projects;
  - (f) Hinemaia River Recreational Fishing Study (2003) and study of alternative ramping scenarios on Hinemaia power station (2003);
  - (g) Cape Kidnappers lodge development Environment Court Appeal (2005);
  - (h) Impact assessment for pesticide-based possum control in Hawke's Bay (2001 – 2008).
  - (i) Assessment of impacts on recreation opportunity from alternative development options for Ocean Beach, Hawke's Bay (2006);
  - (j) Regional gap analysis for the provision of public open space and recreational opportunities in Hawke's Bay (2007).

2. I confirm that I have read the 'Code of Conduct for Expert Witnesses' contained in the Environment Court Consolidated Practice Note 2006. My evidence has been prepared in compliance with that Code in the same way as I would if giving evidence in the Environment Court. In particular, unless I state otherwise, this evidence is within my sphere of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

#### SCOPE OF EVIDENCE

3. Environmental Management Services Limited were engaged by Contact Wind Limited and Contact Energy Limited to prepare a report on Offset Mitigation options for ecology-related effects associated with the proposed Hauāuru Mā Raki (HMR) wind farm and to prepare a report on effects of the windfarm on recreation and tourism.
4. I was the principal author of both of these reports, entitled "Hauauru Ma Raki – Waikato Wind Farm: Assessment for Offset Mitigation of Ecology Related Effects" (the "Offset Report", T17) and "Hauauru Ma Raki – Waikato Wind Farm: Recreation & Tourism Impact Report" (the "Recreation & Tourism Report", T16). A copy of each of the reports is attached as Exhibits M T1 and M T2.
5. In my evidence I present a review of the main findings of these reports. I will also provide an update on any new information or changes of interpretation that have happened since the reports were completed and which may affect my original conclusions and recommendations. I conclude with a summary of updated recommendations in respect of the reports' findings.
6. Part A of my evidence relates to the Offset Report. Part B relates to the Recreation and Tourism Report.

#### LIMITATIONS OF ANALYSIS

7. For the offset mitigation analysis that I will be discussing in my evidence I wish to emphasise (as stated in the Offset Report) that this should be seen as essentially a broad brush exercise. The process of analysis uses hard data where that is available, but elsewhere must inevitably rely on various estimates and assumptions. Those assumptions have greater or lesser degrees of certainty attached to them depending on the present state of knowledge. Where assumptions are made I have, however, adopted a conservative approach (that is, favouring more mitigation rather than less).

My approach has also been to ensure that results are quantifiable and that a transparent chain of logic can be followed through to each of the conclusions and recommendations for specific offset mitigation in the report.

8. I accept that there is room for differences of opinion on how some of the impacts and offset mitigation options should be valued. The values that are used in the Offset Report, and in this evidence, are based on my own assessment and experience, assisted by a structured methodology in accordance with the reasoning outlined here and in the report.

#### SUMMARY OF CONCLUSIONS

##### Summary for Part A : Offset Mitigation

9. There are four actual or potential ecological impacts associated with the proposed windfarm that in my opinion may be addressed by the use of offset mitigation. The specific impacts, and the offset mitigation that I propose in response to these impacts, are as follows:

##### ***Clearance of Native Vegetation***

10. The windfarm project will involve the clearance of approximately 16.3 hectares of native vegetation and potentially topping or thinning of trees amounting to an assessed maximum of another 11.8 hectares. These are highly conservative estimates.
11. My recommendation for offset mitigation in respect of this effect is for Contact to facilitate the retirement and restoration of an area of approximately 56.4 hectares of regenerating native bush that will, in the long term (once regeneration is complete) provide a significantly larger area of replacement bush, of similar type, in place of that required to be cleared for the HMR project.

##### ***Turbine Strike Affecting Native Birds & Bats***

12. The HMR windfarm will present a risk of turbine strike for migratory waders, local bush birds and native bats. The Offset Report sets out offset mitigation options for this potential turbine strike.
13. There are inherent uncertainties in any prediction of risk in this situation. Pending the completion of post-operational strike monitoring, and any operational reviews that may derive from the results of that monitoring, I recommend that Contact commit to an annual contribution of \$17,000 toward

one or more native species conservation programmes focused on the protection and population enhancement of resident and/or migratory native birds. This contribution is recommended as a baseline position and would be subject to potential adjustment upward as collision monitoring results become apparent. I envisage that this offset mitigation would be offered irrespective of whether or not any strike fatalities are actually found.

### ***Transmission Line Strike***

14. There is the potential for the proposed transmission line, where it passes through a branch of Pungapunga wetland, to pose a collision hazard for flying Australasian bitterns and for construction works to disturb breeding bitterns. The evidence of Mr Kessels and Dr Seaton is that these risks can be minimised by use of deflectors on the line and by restricting the timing of works on the external transmission line immediately adjacent to the wetland.
15. My recommendation for offset mitigation of these potential effects is for Contact to commit to facilitating a protective covenant and implementing a weed control programme over a minimum of 5 hectares of Pungapunga wetland (or other wetland of similar value as habitat for Australasian bittern).

### ***Water Abstraction & Laying of Culverts***

16. The windfarm project will require water abstractions for construction use and for the provision of domestic potable water for workers. There is the potential for a minor increase in summer water temperatures. The proposed abstraction of potable water at Whitford Spring will also effectively remove all freshwater habitats from the 100m section of waterway currently supplied with water from the spring. A further impact on freshwater habitats will occur as a result of the laying of culverts. A total of about 68 metres of perennial waterway will be culverted plus about 362 metres of ephemeral waterway.
17. The offset mitigation that I recommend for these effects is for Contact to commit to riparian fencing and planting of 500 metres of channel (both sides) in the lower Kaawa and/or Waikorea Streams. This riparian protection work will provide shading and help prevent damage to whitebait spawning areas caused by grazing by livestock.
18. I further recommend the riparian fencing and planting of Whitford Spring, or alternatively a seep of similar size and ecological value elsewhere on the Waikaretu Stream catchment area.

## Summary for Part B : Recreation & Tourism

19. I conclude that the proposed windfarm will not have any significant adverse effects on recreation and tourism activities in the local area and therefore no mitigation is required on an "offset" basis in my opinion.
20. I note that the construction of the windfarm may open opportunities for some form of beach access to be established. There is currently no reliable public access available to any of the coast in the area. The provision of coastal access would be a positive benefit in terms of local recreational opportunity.
21. I do, however, recommend that any plans for providing access to the beach will need to be carefully considered in terms of potential adverse effects on coastal habitats. It would be advisable to consult with the local Councils and the Department of Conservation prior to developing any such access and to consider carefully the form (e.g. whether vehicular or non-vehicular) that such access, if any, should take.

## PART A : OFFSET MITIGATION

### Background to Offset Report

22. The Offset Report addresses aspects of the project where ecological effects, or 'potential' ecological effects, have been predicted, but where opportunities to 'directly' avoid, remedy or mitigate those effects are limited to the extent that complete mitigation can not, or might not, be achieved. In these situations the remaining option is to provide 'offset' mitigation (otherwise known as 'environmental compensation') as a counter-balance to the predicted adverse effects.
23. The approach that I have followed is based on guidelines set out by the Environment Court in *JF Investments Ltd v Queenstown Lakes District Council* (April 2004). In that case the Court stated:

"... off-site work or services or covenants, if offered as environmental compensation or a biodiversity offset will often be relevant and reasonably necessary under 104(1)(i) if it meets the following desiderata:

- (1) It should preferably be of the same kind and scale as work on-site or should remedy effects caused at least in part by activities on-site;

- (2) It should be as close as possible to the site (with a principle of benefit diminishing with distance) so that it is in the same area, landscape or environment as the proposed activity;
- (3) It must be effective; usually there should be conditions (a condition precedent or a bond) to ensure that it is completed or supplied;
- (4) There should have been public consultation or at least the opportunity for public participation in the process by which the environmental compensation is set;
- (5) It should be transparent in that it is assessed under a standard methodology, preferably one that is specified under a regional or district plan or other public document.

24. The Offset Report is specific to this form of mitigation. It does not attempt to address 'direct' mitigation or avoidance options.
25. In preparing the Offset Report I have relied on the findings of the "Assessment of Ecological Effects" (the "Ecological Report") prepared by Kessels and Associates, and have worked closely with Mr Gerry Kessels (who was the author of the Ecological Report) in determining where effects are predicted to occur, and the likely scale of those effects. I have consulted closely with Mr Kessels in determining the form of offset mitigation that would be most appropriate as an offset to the various predicted effects. The Ecological Report includes a number of specific suggestions for steps that could be taken in this regard. I have also been briefed by Mr Daysh on discussions he has had with the Joint Council and DOC teams regarding their views on the offset mitigation provisions.
26. The Offset Report attempts to define more accurately what these offset mitigation measures would specifically involve and to quantify their scale and estimated cost. The intention is to determine a 'baseline target' for each of the offset mitigation methods – with the baseline being the point at which adverse and beneficial effects are equally matched (preferably with a reasonable margin for error).
27. It is anticipated that any offset mitigation that is offered in respect of the predicted environmental effects of the wind farm would be at least equal to

the scale or dollar value of the baseline target. This is reflected in the offset mitigation measures I have recommended and subsequently outlined in the proposed conditions set out in the evidence of Mr Daysh.

28. The quantitative approach that I have used in the Offset Report is intended to ensure that there is a transparent logic to the determination of each of the baselines. It also enables a dollar value to be calculated for the cost of the offset mitigation work. This is to give an indication of the likely ball-park costs of individual mitigation options and for the offset mitigation package as a whole. It also means that consideration can then be given to the transferability of the same funding to other alternative mitigation options as may be appropriate if there are found to be other ways that the same funding can be spent to achieve a better environmental outcome.

#### Ecological Effects Considered

29. The Offset Mitigation Report considers the following possible environmental impacts, as identified in the Ecological Report:
  - (a) Clearance of native bush,
  - (b) Turbine strike involving native birds and/or native bats,
  - (c) Transmission line strike (particularly involving Australasian bittern), and
  - (d) Effects of water abstraction on river / stream temperatures.
30. Of these 'potential' impacts only one impact (the clearance of some native bush) is certain to happen if the wind farm proceeds. Turbine strike and line strike are less certain but there is the potential for adverse effects if strikes do in fact occur. Further monitoring work is proposed as set out in Mr Daysh's suggested conditions to more accurately determine the level of risk from turbine and line strike. The fourth impact, on stream temperatures as a result of water abstraction, is likely, but will be minor.
31. Each of these four potential effects, and the appropriate offset mitigation, are considered in turn below.

#### Clearance of Native Bush

32. Indicative layout plans for the HMR project show that the construction of turbine platforms and tracks will involve the clearance of approximately 16.3 hectares of native vegetation in the form of either bush or native scrub. The

total area of clearance has been calculated from initial engineering drawings overlaid on aerial photographs showing vegetation and terrain.

33. The final detailed placement of the turbines and access tracks may vary slightly from that shown in the indicative layout plans. In practice, the total area of bush clearance therefore may be slightly more or slightly less than 16.3 hectares – although I do not see much opportunity (given the constraints of the existing topography and inter-turbine spacing limitations) for the total amount of clearance to significantly depart from the presently estimated amount. It is relevant to note that turbine pads only account for about 15% of the 16.3 hectares. The majority of the clearance will actually be associated with track-building. I also note that in the estimation of track-clearance a conservative allowance has been made for assumed 10 metre wide tracks even though in practice the ‘actual’ width of many sections of track will be 8 metres or less. I am also informed by Mr Kessels (whose staff were responsible for the original digitising of clearance areas) that where proposed access tracks follow existing 4-wheel drive bush tracks, as most of them do, the existing tracks were treated as ‘bush’, rather than as already-cleared ground. These various factors together suggest that the estimated 16.3 hectares of bush clearance is likely to be highly conservative.
34. About 32% (5.2 ha) of the cleared vegetation will be advanced secondary conifer-broadleaved forest. Another 32% (5.3 ha) is emergent small-leaved-broadleaved forest (emerging through scrub). The remaining 35% (5.7 ha) is scrub. These figures are, again, based on indicative layout plans and a combination of aerial photography and field knowledge to establish the compositional mix. There may be some variation to these figures depending on the final detailed placement of turbines and access tracks. A margin of error can also be expected in the aerial photo analysis. However, for my purposes, and within a reasonable margin, the figures can be considered adequately representative of the makeup of the affected bush and scrub.
35. All of the bush and scrub referred to here is unprotected native vegetation on private land. Vegetation clearance in ‘H’ cluster is subject to consent under the Waikato District Plan, but clearance in ‘A’ and ‘C’ cluster (which includes Te Umukaraka Bush) has no such restrictions except in any certain limited areas that may be defined as ‘high erosion risk areas’ under the Waikato Regional Plan. Existing landowners in the ‘A’ and ‘C’ cluster areas would therefore be entitled to clear the same amount of bush as proposed for the

HMR project, or more, as of right. Further details on these rules are outlined in the evidence of Mr Chrisp.

36. In addition to the 16.3 hectares of total clearance, an allowance has been made for up to 11.1 hectares of “trimming” (involving topping or thinning) of individual trees where these encroach more than 10 metres above to the base level of the turbine. This will be required to ensure uninterrupted air-flow around the turbines.
37. The area of 11.1 hectares has been calculated as the sum of all bush-covered land around each of the various turbines where the existing vegetation canopy is at or above the base level of the turbine. Of this, only about 2 hectares (i.e. less than 20% of the 11.1 hectares) actually exceeds the 10 metre relative height limit whereupon topping or thinning would be required at the present time. The estimate of 11.1 hectares is therefore highly conservative in terms of the amount of topping and thinning required for establishment of the windfarm. It does, however, allow for further topping and thinning as may be required as trees grow up around the turbines over the next 30 to 50 years.
38. To be conservative in my assessments I have assumed that a⅁of the 11.1 hectares will require topping and thinning, and that the severity of the topping and thinning will be equivalent in effect to total clearance.
39. Finally, another addition to the total area of topping and thinning is an allowance for trimming or removal of taller trees beneath the transmission line through Limestone Downs. This was not factored in to my earlier assessment but Mr Kessels’ evidence notes that up to a maximum of 0.7 hectares of bush may need to be cleared or trimmed for the purposes of the external transmission line where it traverses Te Umukaraka Bush.
40. Altogether, the total area of bush clearance (both ‘actual’ and ‘assumed’) therefore comes to about 28.1 hectares. This is up from 27.4 hectares as earlier stated in the Offset Report. Compositionally, it includes about 18.1 hectares of maturing or emergent bush and 10 hectares of scrub.
41. In the Offset Report I have also made allowance for ‘edge effect’. This is the effect of exposure to wind, sunshine and weed invasion along the edge of newly-cut forest clearings. The forest along the edge may undergo some compositional changes (in favour of bush edge species). There can also be wind-throw. The extent of edge effect will vary from site to site depending on

degrees of wind exposure and depending on the type of vegetation that is present. Mature bush is the most susceptible. Advanced secondary forest is also vulnerable, but less so. Thereafter comes emergent forest and scrub, which are relatively well adapted.

42. The extent of edge effect will also depend on the effectiveness of mitigation work. As Mr Kessels explains in his evidence, there will be edge-planting along the more exposed newly-cut forest edges as an active mitigation measure to reduce edge effect and block the establishment of weeds. Edge-planting and general weed control will be carried out in accordance with site-specific Construction Effects Ecology Management Plans as set out in the conditions attached to the evidence of Mr Daysh.
43. To be conservative I have allowed for 17.4 hectares of edge effect. That equates to 1 hectare of edge effect for every hectare of mature or emergent bush (but not scrub) that is either cleared, topped or thinned. Added to this should be another 0.7 hectare associated with topping and thinning beneath the lines at Limestone Downs.
44. On this basis, inclusive of 'actual' clearance, 'trimming' and 'edge effect' I arrive at a total of 46.2 hectares as the "area of damage" on native vegetation. Of this, 16.3 hectares is 'actual' clearance; 11.8 hectares is 'trimming' (involving topping or thinning to maintain a canopy height of no more than 10 metres above turbine base, or underneath transmission lines); and 18.1 hectares of assumed 'edge effect'.
45. The methods that I have considered (and which accord with the methods recommended in the Ecological Report and evidence of Mr Kessels) for offset mitigation of this effect are:
  - (e) intensive, sustained and targeted pest control.
  - (f) enhancement of the ecological quality of targeted natural features (for example, through retirement and restoration of an equivalent-sized area of semi-grazed coastal scrubland), and
  - (g) providing funds and facilitating long term formal legal protection of affected key natural features on private land within the Waikato wind farm study area.
46. I concluded in the Offset Report that if pest control was used as an off-set mitigation measure then an appropriate scale of mitigation would be to carry

out pest control in a 'stand-alone' (i.e. not easily re-invaded) block of bush of the same size as the total area of bush clearance, topping and thinning. That equates to an area of 46.2 hectares. The Offset Report, which did not include trimming beneath the transmission line, proposes 44.8 hectares. I have specifically suggested targeting stoats and rats.

47. If retirement and restoration of land elsewhere is the method used then I suggest in the Offset Report an area of approximately 55 hectares. This was simply calculated as being equivalent to a doubling of the total area of clearance-plus-trimming. With an allowance for the extra 0.7 hectare of trimming beneath the transmission line through Limestone Downs (also doubled) that should now be increased to 56.4 hectares.
48. The detailed reasoning for each of these findings is as outlined in the Offset Report. I do not have any substantial changes to make in respect of those original findings for the purpose of my evidence. My only comment would be that for the option of pest control it may be appropriate to also include goats, pigs and deer as additional target species. This would have some long term benefits for forest regeneration, whereas targeting of rats and stoats is mainly concerned with bird predation. The inclusion of goats, pigs and deer in the list of target species would not be difficult (over an stand-alone bush block of 44.8 hectares) and would not significantly alter the total estimated cost of predator control work.
49. With respect to the retirement and restoration option I consider that the appropriate objective, to be in accord with JF Investments guidelines, would be to aim for an exchange that is as much as possible 'like-for-like'. In the interests of certainty I suggest that it would also be appropriate for the figure of 56.4 hectares to be set as a minimum target. The area selected would also need to be specifically within the Raglan or Meremere Ecological District.
50. My overall recommendation, as a choice between these two options, would be to favour retirement and restoration of an area of 56.4 hectares of regenerating but currently degraded bush. I consider that this option would most directly and most effectively comply with the JF Investments guidelines.

#### Turbine Strike Affecting Birds

51. The other main area where offset mitigation could be required is as compensation for possible bird-strike. Of particular interest are the migratory waders that fly along the western coastline (of which South Island pied

oystercatcher and wrybill are of most interest), but I understand from the evidence of Mr Kessels and Dr Seaton that bush-birds (particularly kereru, tui, and morepork) may also be at risk. In addition, as I understand it, the presence of and therefore risk to New Zealand Falcon can not yet be ruled out.

52. At the time of writing the Offset Report there was no specific data on migratory bird movements. My original assessment also pre-dated the later Kessels Associates reports on bird count and strike risk for kereru, tui and morepork prepared as part of the 5 December 2008 Section 92 response. The Offset Report assumes that strikes would be unlikely (based on prevailing behavioural theory) but that a small number of strikes could still occur each year.
53. I also assumed, when I wrote the report, that the intensity of post-operational bird-strike monitoring would be similar to the relatively low level of monitoring conducted on other existing New Zealand wind farms. Hence, some reasonable allowance is made in my assessments for possible non-detection of strikes. I did not in particular anticipate the type of intensive post-operational monitoring (including in particular establishment of a dedicated 'collision carcass retrieval team') now proposed by Contact and as outlined in the evidence of Mr Daysh.
54. I provide some estimates in the Offset Report for a 'background' or 'sub-detection' rate of bird strike and suggest this rate could be used as a baseline for calculation of offset mitigation.
55. My analysis assumed that offset mitigation would take the form of predator control, whereby the loss of birds due to turbine strike would be compensated by increased survival and reproduction of birds as a result of the control of animal predators. I have worked out some rough-order costings for offset mitigation on this basis. This is as described in the Offset Report. My estimates are between \$7,000 and \$17,000 per annum.
56. Pending the completion of post-operational strike monitoring, and the operational review that will follow on from that monitoring (which may in turn identify a need for strike avoidance or mitigation strategies of the kind discussed in the evidence of Dr Seaton), I consider it appropriate that precautionary off-set mitigation should be offered in respect of potential bird strike. That offset mitigation would effectively cover the possibility of a low

level of strikes. I envisage that this offset mitigation would be offered irrespective of whether or not any strike fatalities are actually found.

57. My specific recommendation at this time is that a sum of \$17,000 per annum should be allowed for and that this funding should be made available for conservation work relevant to the protection of native bird species identified as potentially at risk of turbine strike. I recommend that this funding should be provided for the lifetime of the project unless and until such time as it can be conclusively shown that the turbines are having a nil effect on native birds. I note that the suggested consent conditions outlined in the evidence of Mr Daysh would allow for an upward review of the dollar value of this mitigation (as part of a wider review of all mitigation options for bird strike carried out by the Ecology Peer Review Panel) in the event that pre-operational modelling predicts a significant rate of strike, but that any reduction would require a variation to those conditions.
58. The suggested \$17,000 per annum would be, in effect, a non-refundable minimum payment, pending definitive results from the post-operational monitoring.
59. This approach would, in my opinion, satisfy the JF Investments guidelines. It would be an unusual approach insofar as the offset mitigation offered would be on a 'precautionary' basis until more information has been gathered on the actual risk and rate of strike. The recommended offset mitigation would nevertheless be directly relevant to the potential effect. In the event that funding was used for the benefit of migratory bird species, even though the work involved would not be strictly 'on site', I suggest that it would be appropriate for an exception to be made in this case, and that such an exception would be in accordance with the JF Investments criteria as a whole.

#### Turbine Strike Affecting Bats

60. At the time of writing the Offset Report I assumed that, even though no bats have actually been found in the area during recent surveys, there might still be bats present. I therefore made some allowance in my overall estimates for offset mitigation for potential loss of bats. The figures that I arrived at are as outlined in the Offset Report.
61. This was obviously a conservative approach as it still remains to be seen whether native bats actually do exist in the area. I nevertheless concluded

that it would be better to make some allowance for offset mitigation for bat strike as long as there was any reasonable chance that bats might yet be found.

62. I have recommended in the Offset report that offset mitigation could either take the form of animal pest control or bat research and conservation work. This would be provided as a 'precautionary' offset in the absence of certainty around the existence/ non-existence of bats and uncertain level of risk of strike if bats are in fact present.
63. Since the Offset Report was written I am, however, aware that Contact are now proposing a further round of bat monitoring. This is as outlined in the evidence of Mr Daysh. Monitoring will be carried out at each of the turbine sites in the pre-construction period and prior to the completion of Construction Effects Ecology Management Plans for each turbine cluster. If this process is followed I do not see that there will be much of a possibility for any remaining doubt as to the presence or otherwise of native bats. If no bats are actually found during this survey I would find it hard to justify offset mitigation.
64. If bats are found then I suggest that direct (rather than offset) mitigation, including bat relocation or on-going population monitoring, would be the more appropriate response. These are matters that can be dealt with through site-specific Construction Effects Ecology Management Plans.

#### Transmission Line Strike

65. In the Offset Report I have also made an allowance for the risk of birds (specifically Australasian bitterns) colliding with the proposed transmission line where the line traverses a branch of Pungapunga wetland. This risk was identified in the Ecological Report and subsequent Kessels & Associates report entitled *Assessment of Bittern Abundance and Collision Risk* (December 2008 – note this post dates the Offset Report).
66. Whether there is a significant risk of bittern strike actually occurring remains to be seen. Line-strikes are known to occur but recorded instances are rare and quantitative data completely lacking. From my own enquiries (including enquiries with the Whangarei Native Bird Recovery Centre, where injured native birds are treated) I was able to find just one previously-known example. No doubt there are others that go undetected and unreported. But given that there are over 11,000 kilometres of transmission line in New

Zealand, and many more thousands of kilometres of local power and telephone line, yet so few strikes are known of, I have assumed that bitterns are capable of at least some degree of collision-avoidance and that collisions are more the exception than the rule.

67. I further note that at Pungapunga wetland there is the option of installing line markers on the 500 metres of line in question. The installation of markers has been recommended by Mr Kessels in the Bittern Abundance and Collision Risk Report. According to Mr Kessels' report, overseas experience has shown that line markers can be highly effective in reducing the incidence of strike.
68. Considering all of these factors, I have assumed that the rate of strike on the 500 metre section of line at Pungapunga wetland would be unlikely to exceed 1 strike every 5 years.
69. The evidence of Dr Seaton discusses potential disturbance of bittern through construction activities in the area. This is proposed to be controlled through a restriction of construction timing in the immediate vicinity of the wetland.
70. The offset mitigation that I have suggested for this potential effect is 5 years of animal pest control in a wetland where Australasian bittern are known to nest and breed. The other option I suggest in the Offset Report is funding for bittern research.
71. A further option, put forward in the Bittern Abundance and Collision Risk Report (December 2008), is to provide wetland enhancement. The report states that Pungapunga wetland would be an ideal site for this type of work.
72. Of these three options (predator control, research and wetland enhancement) the option of research would probably least comply with the JF Investments guidelines, even though a successful research programme could potentially provide the greatest good. Predator control and wetland enhancement would both comply – especially if undertaken in Pungapunga wetland itself.
73. Overall, my recommendation at this time would be to take the wetland enhancement option. This would be a tangible form of mitigation – although dependent on Contact securing appropriate land in the area. If this is not possible, I recommend utilising another wetland of equivalent value to Australasian bittern.

74. I recommend, specifically, that Contact undertake to provide a protective covenant over a minimum of 5 hectares of Pungapunga wetland (or an equivalent wetland) and for this protection to be supported by the implementation of a programme of wetland enhancement, focused on weed control. This protection and enhancement work would be offered as a 'precautionary' offset for potential line strike involving Australasian bittern and for potential disturbance of bittern through construction activities in the area..

#### Water Abstraction and Culverts

75. The last of the effects that may require offset mitigation are the effects of water abstraction during the course of the construction phase of the project and effects from the construction of culverts. The first of these is addressed in the Offset Report. The latter (construction of culverts) is an issue that emerged subsequent to completion of the report but for which the same or similar offset mitigation can be applied.
76. Abstraction has the potential to increase stream temperatures as a result of shallower water and reduced volume in the relevant streams. At one of the water abstraction sites (Whitford Spring) there is also concern that the proposed abstraction will take effectively all of the water from a 100 metre long section of waterway between the spring and confluence with the Waikaretu Stream. The water that is taken from the spring will be used for domestic purposes and therefore needs to be abstracted from as close as possible to the point where the water emerges from the ground.
77. The concern in relation to culverts is that they will 'occupy' sections of river and stream-bed and thereby diminish the habitat value of the stream-bed in the space where they are laid. There will be 14 culverts altogether, with a combined total length of about 430 metres.
78. The majority of culverts (11 of the 14) will be laid across ephemeral (i.e. intermittently-flowing) streams, seepages and drains. Only 3 culverts will be over perennial (i.e. permanently-flowing) waterways. The total amount of stream channel in the perennial waterways that will be affected by culverts equates to about 68 metres. The waterways in question (both ephemeral and perennial) generally to have a low quality of existing habitat. Three are rated as 'moderate-to-poor' quality habitat. The rest have either 'poor', 'poor-to-very poor', 'very poor' or 'nil' aquatic habitat value. Some offset mitigation could nevertheless be provided in respect of at least the perennial waterway crossings.

79. The Ecological Report concludes that the effect of the proposed water abstractions on stream water temperatures will be no more than minor. Abstractions will cease when flow rates drop below 90% of the 5-year low flow. This means that only barely detectable increases in water temperature are predicted to occur. In my opinion, given the scale of impact, there is in fact a question over whether offset mitigation is really necessary at all. I have nevertheless made some allowance for this effect in the Offset Report.
80. My recommendation is that Contact commit to riparian planting and fencing near the mouth of one of the major whitebaiting streams. This would provide shading and improve the spawning habitat for whitebait. I have suggested (after consultation with Mr Kessels) that this could take the form of planting and fencing a 400 metre long by 3 metre wide strip along both sides of the stream-bank in the lower Kaawa or Waikorea Stream. Both of these are important white-baiting streams.
81. With regard to possible effects on the 100m reach of waterway at Whitford Spring I further suggest (as recommended by Mr Kessels in the November 2008 *Supplementary Assessment of Streams and Seepage Zones*) that an additional allowance could be made for restoration and protection works in a seep within the Waikaretu Stream catchment. The total length of channel affected below the spring is about 100 metres. I recommend that fencing and riparian planting should be undertaken at either this same length of channel at Whitford Spring (given that the flow at the spring will return to normal once the construction phase of the project is over) or at another similar spring or seep area elsewhere in the Waikaretu Stream catchment.
82. As offset mitigation for the laying of culverts (not included in the original Offset report) I suggest a further extension of the riparian planting by another 100 metres along the banks of the lower Kaawa or Waikaretu Stream. I consider this to be a reasonably conservative allowance, given that only 68 metres of permanent waterway will actually be affected by culverts. The rest are over ephemeral streams, seepages and drains.
83. Altogether, as offset for water abstraction and culverting, this will equate to 1,000 metres of fencing and riparian planting (500 metres on either bank) on the lower Kaawa or Waikorea Stream, plus either fencing and riparian planting along the Whitford Spring outflow channel or other seep area in the Waikaretu Stream catchment area of equivalent size (comprising approximately 100 metres of channel).

84. This offset mitigation would, in my opinion, comply with the JF Investments guidelines. Riparian protection would be an appropriate response to potential minor increases in water temperature (by providing shading) and would actively enhance these waterways as habitats for native fish and aquatic invertebrates.
85. The offset I have suggested here is, of course, subject to confirmation of land access and agreement from the relevant landowners for Contact to undertake the specified works. I understand that negotiations with landowners are currently underway and that Contact intends to have specific access agreements in place ahead of the Board of Inquiry hearing whereby firm site-specific commitments can be made in respect of this offset mitigation. In the event that these negotiations are not completed, more general default conditions will be required.

#### PART B : RECREATION AND TOURISM

##### Recreation Overview

86. The Recreation & Tourism Report concludes that opportunity is very limited on account of the almost complete lack of publicly accessible recreational space. Of particular significance is the fact that public access to any of the 35 kilometres of coastline is all but completely barred. There are also very few marginal strips along the various waterways and those that exist can not be readily accessed from public roads. Nor are there any significant public reserves. The two DOC reserves in the area are 55 hectares and 0.5 hectares respectively and have no tracks or other facilities. There is, therefore, little for visitors to do in the area that does not involve access over private land.
87. The two main recreational activities are whitebaiting and the now biannual Rally of New Zealand. The Rally runs for three days, with one of those days spent in the Port Waikato – Te Akau area, and makes use of public roads.
88. The whitebaiting season runs from mid-August to the end of November. But because of the lack of marginal strips access to whitebaiting sites is generally dependant on either formal or informal access over private land. At the opening of the season, on any given day, there may be in the order of 15 – 20 whitebaiters fishing various streams.
89. In a regional context the area is not unique or particularly varied in terms of the range of recreational settings that it contains. The ROS (recreational

opportunities spectrum) classifications are predominantly 'rural' with small pockets of 'back-country accessible'. These are respectively the most common and second most common ROS classifications in the Waikato Conservancy.

#### Tourism Overview

90. There are two existing tourism operations in the area – Nikau Caves and Adventure Waikato.
91. Nikau Caves (run by Anne & Phillip Woodward) offer tours through the limestone cave on the Woodward property with farm-stay accommodation on site. At the time of writing the report the Woodwards were also in the process of completing a café across the road from their home on Waikaretu Valley Road. The Woodwards are parties to the wind farm project and generally support it. They anticipate that the windfarm could provide an opportunity for extending the range of tours that they have on offer.
92. The owners of Adventure Waikato are Simon and Rosemary Worsp. They provide a range of adventure activities including caving, abseiling, climbing, orienteering and various other pursuits suitable for family groups, school groups and for corporate team-building. Accommodation is also offered on site. At the time that the Recreation & Tourism Report was written the Worsps were undecided what effect the wind farm project would have on their operation but indicated that heavy traffic (during the construction phase) and effects on local aesthetics were likely to be the main areas of concern.

#### Effects on Public Recreation

93. I conclude in the Tourism & Recreation Report that the wind farm is unlikely to have any significant effect on local recreational activity or opportunity. This owes mainly to the fact that there is very little public recreational activity in the area at the present time and very little public access. There is, therefore, not much existing activity or potential future activity to affect.
94. As long as construction run-off is adequately managed, during the construction phase of the wind farm, the whitebait fishery will not be adversely affected. Nor is the experience of whitebaiting, in my opinion, likely to be significantly affected by the presence of wind turbines. Local whitebaiters typically fish only a short distance from their cars and do their fishing in a modified (rural pastoral) landscape. In general they do not actively seek out the more remote and scenic areas for whitebaiting unless

those areas are also where the best fishing happens to be. Individual whitebaiters may like or dislike the sight of the turbines but the overall effect of the presence of the turbines on the experience of whitebaiting I predict will be no more than minor.

95. The Rally of New Zealand should also be largely unaffected. Discussions have been had with the organisers of the rally. Its submission (number 44) is neutral and focuses on issues addressed in the evidence of Mr Galloway. However, it states that “the photographic interest in the area during rally events will very likely be enhanced by the presence of a Waikato Wind Farm.”

#### Effects on Tourism

96. The two potential issues for the owner-operators of Adventure Waikato were effects on landscape aesthetics for visitors to the property, and conflicts between construction traffic and traffic going to and from the Adventure Waikato site.
97. The nearest turbine (part of the ‘F’ cluster) will be about 1.9 kilometres from the Adventure Waikato buildings. The turbines will not be particularly visible from here but will be visible from other more elevated parts of the property. Visitors will nevertheless be aware of the turbines, even if they can not see them, and their perception of the naturalness and remoteness of the area in general may be influenced by this. However, in the context of an already modified rural setting, and in consideration of the social / interactive nature of the activities undertaken on the property, this awareness of the distant presence of the turbines is unlikely, in my opinion, to significantly impact on or detract from the visitor experience.
98. Following discussions with Mr Galloway (Contact’s traffic engineer), and from my own assessment of construction traffic movements, I conclude that construction traffic is also unlikely to significantly affect the Adventure Waikato operation. In the Recreation and Tourism Report I have overlaid (in Figure 10) the proposed construction routes and routes taken by visitors to Adventure Waikato arriving from Auckland and Hamilton. Visitors from Auckland will follow a construction route as far as Waikaretu but will be free of construction traffic for the remaining 10 km of the trip to Adventure Waikato. In the direction of Hamilton the nearest construction route is about 15 km away from the site and overlaps for less than 1 km of road.

99. There were no issues identified by the owners of Nikau Cave. They are generally supportive of the proposal and see it as being more likely to have a positive than negative effect on their operation.

#### Mitigation and Enhancement Measures

100. My brief in completing the Recreation & Tourism Report was to also advise on any methods of mitigation and enhancement that could be used to deal with recreation or tourism related effects.
101. My conclusion is that the proposed wind farm project will not have any significant effect on either recreation or tourism. There are, therefore, no recreation and tourism-related impacts that I can foresee that would require specific action to mitigate.
102. I do, however, conclude that there may be opportunities for enhancement of recreational opportunity in conjunction with the development of the wind farm if the project proceeds.
103. This may include the development of coastal access. As I have mentioned, the lack of existing coastal access is probably the greatest single constraint on recreational opportunity in the area at the present time. There are currently no access opportunities for the general public along the entire project coastline.
104. If coastal access could be provided as a result of the wind farm then this would be a significant recreational benefit. Opportunities for the development of one or more points of coastal access could be investigated. I do, however, recommend that any such investigations should be carried out in consultation with the Department of Conservation, with regard to potential effects on native birds and rare plants resulting from the introduction of people, and possibly vehicles and dogs, in to areas where people have to date been effectively excluded. Pedestrian-only access, if access is to be allowed at all, may be preferable.
105. There would also be some benefit in the construction of one or more viewing platforms and information points for visitors to the area to get a better outlook on the wind farm and wider landscape.
106. I have assessed the potential for coastal walking tracks and mountain-biking circuits around the wind farm (using, in part, the tracks developed for the project) but conclude that any such initiative would be highly dependant on

the landowner interest and would most likely have to be run on a commercial basis in order to work. I do not consider it likely that such an initiative would get off the ground or be sustainable in the long term.

Response to Submissions

107. There are a number of submissions, including Mr Gemmell (number 61), Mr Church (number 67), King (number 75), Mr Hansen (number 76), Franklin District Council (number 79) and Mr Carr (number 94), that raise general issues as to recreation and tourism. For the reasons expressed above, and in the Recreation & Tourism Report, I consider any adverse effects to be minor and appropriate. Further, there are opportunities for positive recreation and tourism outcomes.

M J Tonks

Exhibit M T1

Hauaunu Ma Raki - W aikato Wind Farm : Assessment for Offset  
Mitigation of Ecology Related Effects - dated June 2008

**HAUĀURU MĀ RAKI-WAIKATO WIND FARM**  
**ASSESSMENT FOR OFFSET MITIGATION**  
**OF ECOLOGY RELATED EFFECTS**

**Prepared For:**

Contact Wind

**June 2008**

**FINAL**



**ENVIRONMENTAL MANAGEMENT SERVICES**  
*Limited*

**000002**

## Executive Summary

This report presents an assessment of environmental compensation / offset mitigation options for the proposed Hauāuru mā raki-Waikato Windfarm project associated with identified ecological effects. The aim of the report is to identify where environmental compensation may be required and to provide, wherever possible, specific quantifiable baseline targets for achieving a fair environmental exchange.

Where possible we have also sought to ensure that dollar figures are provided for the estimated cost of providing the various off-set mitigations. The intention is to provide at least an indication of likely ball-park costs. The value of these mitigation works, if given a dollar value, can then also be regarded as transferable to other alternative mitigation options as may be necessary or appropriate.

Three possible ecological impacts associated with the proposed wind farm, as identified in the June 2008 Kessels & Associates Ecological Assessment could be addressed through off-set mitigation. Those impacts are:

1. The clearance of 27.4 hectare of native bush and scrubland.
2. Potential bird and bat strike (into wind turbines or transmission lines).
3. A fractional increase in water temperature in streams used for water abstraction during the construction period.

The effect of the clearance of the 27.4 hectare of bush as species habitat could be compensated by providing for the control of mustelids and rats in a 44.8 hectare area of bush somewhere in the wind farm area. The cost of this work is estimated to be about \$22,000 per annum.

An alternative option would be to facilitate the retirement, legal protection and restoration of bush in an area of about 55 hectares of land with ecological potential. The 40 ha area of semi-grazed land in between the coast and Te Kotuku Bush has been specifically identified as one area that would be suitable for this purpose but would be dependant on landowner agreement. The estimated cost of retirement and basic restoration (assuming no change of ownership for the land) would be about \$200,000. To bring the total area up to 55 hectares another 15 ha would be needed in addition to this. A total cost of \$280,000 is therefore estimated overall.

For turbine strike Kessels & Associates predict a low to moderate risk for kereru and migratory waders but low risk for other bush birds and bats.

There is no historical evidence of turbine strike involving kereru at any of the existing New Zealand wind turbines but concern remains at the possibility of either juvenile or displaying adult birds potentially colliding with turbines over areas of bush.

The risk assessment for waders reflects the lack of observational data and therefore lack of certainty on migratory flight paths. Logic suggests that they are likely to use the coastal cliffs as a navigational reference and fly on the seaward side of the cliffs in the zone of uplift. This would put them clear of the wind turbines. But in the absence of more detailed monitoring information this can not yet be confirmed. The Ecological report recommends that further monitoring is carried out.



Unless the proposed monitoring proves otherwise it is, however, assumed for the purpose of the current assessment that the birds will follow what appears to be the logical migratory course (seaward of the coastal cliffs) and that the rate of turbine strike involving migratory waders will therefore be either nil or so low as to be undetectable. If the latter is true then an annual rate of 1.8 bird strikes has been assumed (based on 0.01 strikes per turbine per annum).

As replacement for these assumed fatalities it is proposed that funding could be directed toward species protection and recovery work either in the area or elsewhere in New Zealand and that the minimum scale of funding should be sufficient to achieve at least a 10 times replacement for the assumed loss. Sufficient effort and funding would therefore be required to ensure, as a minimum, the survival of 18 more birds (preferably migratory wading birds) per annum. The cost of achieving this minimum target is estimated to be about \$7,000 a year if focussed on migratory waders or \$17,000 p.a. if focussed on kereru.

For migratory birds a better alternative to offset mitigation may be to implement early warning techniques such as the use of radar if the further proposed migratory shorebird monitoring programme determined there was in fact potential for significant adverse effects on particular populations of migratory birds. It may, for example, be feasible and effective to detect migratory bird flocks with radar and have a system whereby particular turbines are slowed or stopped until such time as it is calculated the migrating flock has passed.

For migratory birds it is considered that the exact type and strategy, if any, to avoid, remedy or mitigate not be determined until the proposed monitoring programme and associated risk assessment is completed.

Bats are assumed to be present in the area although there have been no confirmed sightings in any of the recent surveys to date. For these the Ecological Assessment predicts a low probability of significant mortality occurring due to turbine strike. The report acknowledges that there is, however, a degree of uncertainty in this prediction and recommends verification through post-operational monitoring.

For the purpose of off-set mitigation a 'low' level of bat strike is assumed to equate to a rate of about 0.4 bat strikes per annum. If so, sufficient effort and funding would be required to ensure, as a minimum, the additional survival of about 4 long-tailed bats per year (10 x the rate of assumed mortality). This could potentially be achieved as part of the mustelid and rat control package described above and costing an estimated \$22,000 per annum. The alternative recommendation is to provide a general fund for bat research and conservation work at a suggested rate of \$50,000 per annum over 5 years.

The Ecological Assessment also identifies a potential risk associated with Australasian bitterns colliding with the transmission line proposed to be built over a branch of the Opoutia wetland. A moderate level risk is assumed. Collisions appear to be uncommon and a rate of 1 bittern fatality per 5 years has been assumed. Off-set mitigation options recommended include targeted pest control (costing \$7,000 over annum over 5 years) and bittern research (\$20,000 per annum over 3 years).

Water abstraction is not expected to have a significant effect but will fractionally contribute to high water temperatures in streams over the summer during the construction phase. The very minor scale of effect means that off-set mitigation is probably not justified. However, one option would be to provide targeted fencing and riparian planting, especially focussed on key



whitebait spawning areas. The preferred locations would be near the mouth of either the Kawaa Stream or Waikorea Stream. The cost of this work at either stream would be about \$32,000.



Depending on the options chosen, the inflation-adjusted nett present value (NPV) of all of the off-set mitigation measures combined is between \$693,700 and \$919,200.

The delivery of this mitigation funding could be either by direct funding of the actions themselves (by Contact Wind) or through a new or existing community trust or via direct funding to agencies such as the Department of Conservation or Environment Waikato. If administered through a trust or other agency this would enable greater flexibility in the way that the funding is specifically used (e.g. through a contestable fund).



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## 1. INTRODUCTION

This report presents an assessment of ecology-related environmental compensation / offset mitigation options for the proposed Hauauru ma raki Waikato Windfarm project. The aim of the report is to identify where environmental compensation may be required on the project and to provide, wherever possible, specific quantifiable baseline targets for achieving a fair environmental exchange. We have also sought to provide indicative costings.

‘Environmental compensation’ means mitigating actual or potential adverse effects (in this case the effects of the wind farm) by providing benefits elsewhere that will indirectly either compensate for, or cancel out, an impact associated with the development that can not otherwise be directly avoided.

Guidelines for the use of environmental compensation as an RMA mitigation technique have recently been provided by the Environment Court in the decision on *J F Investments Ltd v Queenstown Lakes District Council* (April 2006). The Court concluded that “*off-site work or services or covenants, if offered as environmental compensation or a biodiversity offset will often be relevant and reasonably necessary under 104(1)(i) if it meets the following desiderata*<sup>1</sup>:

- (1) *It should preferably be of the same kind and scale as work on-site or should remedy effects caused at least in part by activities on-site;*
- (2) *It should be as close as possible to the site (with a principle of benefit diminishing with distance) so that it is in the same area, landscape or environment as the proposed activity;*
- (3) *It must be effective; usually there should be conditions (a condition precedent or a bond) to ensure that it is completed or supplied;*
- (4) *There should have been public consultation or at least the opportunity for public participation in the process by which the environmental compensation is set;*
- (5) *It should be transparent in that it is assessed under a standard methodology, preferably one that is specified under a regional or district plan or other public document.*

The following assessment considers how environmental compensation / offset mitigation measures could be applied in respect of the proposed Waikato Windfarm project, in accordance with these guidelines, to address potential environmental impacts associated with the development.

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<sup>1</sup> *JEFF Investments Ltd v Queenstown Lakes District Council* (p.19)



## 2. METHODOLOGY

The Environment Court guidelines for environmental compensation / off-set mitigation, as listed in the Introduction to this report, include a requirement that the determination of appropriate mitigation should be done in a transparent way.

Our approach has been to provide, wherever possible, a quantitative assessment for off-set mitigation and to ensure that the assumptions built in to these calculations are both reasonably conservative and fully explained. Where numerical estimates are required we have sought out the results of previous research to act as a guide. The sources for this information are referenced throughout the report.

We are, however, inevitably dealing with an imperfect science. We do not claim that these figures are perfect or that it is not possible for other interpretations to be made. But our aim is to at least provide a starting point for discussion of what off-set mitigation may be necessary and on what scale.

Note also that this report only sets out to define a minimum or ‘baseline target’ level of mitigation for each of the relevant effects. This is not to say that the minimum is what should or will, in the end, be provided.

In this report a point has also been made of providing, where possible, dollar figure estimates for each of the off-set mitigation options. This is to give an indication of the likely ball-park costs of individual mitigation options and for the off-set mitigation package as a whole. It also means that consideration can then be given to the transferability of this same funding to other alternative mitigation options as may be appropriate if there are found to be better ways that the same funding can be spent.

For example, as a calculation of off-set mitigation required for the risk of bird strike the report assumes that mitigation would be in the form of predator control. This assumption allows a calculation to be made of the potential for ‘replacing’ the birds that are lost to bird-strike via predator control and for a baseline target and numerical cost to also be calculated. However, it may be that a better use of the same funding would be to either contribute to wading bird research or assist in the purchase and protection of habitat areas (such as, for example, the North Raglan Head, or one of the various higher value patches of remnant forest in the wind farm area).

The final delivery of off-set mitigation measures therefore may not necessarily be precisely in the way described in this report. In some (and possibly all) cases it may be preferable to direct funding in to other works or existing conservation projects if it can be seen that these works or projects will deliver better outcomes. This is seen as a matter for discussion with agencies such as the Department of Conservation, Waikato Regional Council, Franklin District Council and Waikato District Council.



### 3. POTENTIAL EFFECTS OF THE WINDFARM

The ecology-related effects of the wind farm are as described in Kessels & Associates (June 2008) *Contact Wind Ltd Hauauru ma raki Waikato Wind Farm Assessment of Ecological Impacts*. The report lists the following ‘direct’ and ‘indirect’ potential impacts<sup>2</sup>:

#### Direct Impacts

1. *Habitat loss and damage, and destruction of plants and other wildlife, in the course of wind farm, transmission line and access road construction;*
2. *Sediment run-off from road and turbine construction affecting waterways; and*
3. *Mortality of individual birds, flying insects, and bats when in collision with the turbines, transmission lines or associated wind farm structures.*

#### Indirect Impacts

1. *Disturbance either from the wind farm and associated activities (noise, visual);*
2. *Reduced breeding success of individual birds or other wildlife nesting in close proximity to the wind farm;*
3. *New weeds being introduced into bush and wetland areas by machinery etc; and*
4. *Increased predation and scavenger pressure in treeless, unbuilt areas and adjoining fauna habitats, as the wind farm may provide suitable perches and shelter for predators that previously did not inhabit the area. It may also lead to increases in predators currently utilizing the area, by creating a habitat which will support a greater population of predators or by forming optimal conditions for reproduction.*

Of these ‘potential’ impacts the report finds that there is essentially just one impact that is both significant and certain to happen if the wind farm project proceeds. That is the direct loss of approximately 27.4 hectares of regionally significant bush and scrubland in the privately-owned Ramsden Farm, Te Umukaraka and Te Kotuku Bush areas.

In addition the Ecological Assessment concludes that there is a risk of mortality of individual birds and bats due to turbine strike or as a result of flying in to transmission lines. The main species of concern among the bush birds, as regards turbine-strike, are tui and kereru. The potentially affected bat species is the long-tailed bat. There is also a risk for migratory and non-migratory waders (notably wrybill, NZ dotterel, Caspian tern and South Island oystercatcher). With regard to bird-strike in to transmission lines the main species of concern is the Australasian Bittern.

Experience with wind farms elsewhere in New Zealand and comparable situations overseas (as referenced by Kessels & Associates) suggests that there is a low risk of significant rates of turbine-strike mortality occurring among bush birds, including kereru and tui, or among resident long-tailed bats.

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<sup>2</sup> Kessels & Associates (2008) *Contact Wind Ltd Hauauru ma raki Waikato Wind Farm Assessment of Ecological Impacts*.



There is, however, continuing uncertainty with regard to the risk for migratory waders. For the proposed Hauāuru mā raki-Waikato Windfarm the Ecological Assessment concludes that the route most likely to be taken by migratory birds will be to seaward and at a lower altitude than the wind turbines. Otherwise, in the event that a turbine appears in the path of a migratory bird, they are also likely to see and consciously avoid them. These conclusions are based on present knowledge of migratory flight behaviour (with particular focus on wrybill and South Island pied oystercatcher). Yet there remains a great deal that is still unknown or uncertain about these migratory flights. In particular, the extent to which birds are likely to fly inland of the shoreline when flying at night and/or in conditions of poor visibility.

Logic suggests that wrybills and oystercatchers will still follow the coastline, with the cliffs and shoreline providing a navigational reference, and the cliffs themselves providing uplift in on-shore winds. At night, or in poor visibility, it is logical that they should fly at relatively low altitude in order to maintain a visual sighting of the cliffs and shoreline. And for birds migrating to the Firth of Thames it is most likely that they would cut across the North Island either from Raglan or (more likely) Port Waikato. From Port Waikato they would be able to navigate via the Waikato River through to Maramarua and on to Miranda. All of this suggests that the birds are not likely to fly directly through the wind farm. Yet, as logical as this may seem, the fact remains that there is still a great lack of specific observational data on the flight paths of these birds. Until such time as bird movements have been more accurately monitored (the Ecological Assessment recommends a programme of radio-tracking) the above-stated hypothesis can not be confirmed. Until that further information is at hand a 'low to moderate' assessment of risk for migratory shore birds has therefore been determined in the ecological report.

In respect of the risk of transmission-line strike the report concludes that the risk for the majority of bird species is generally low. The exception to this assessment is with regard to the risk to Australasian bitterns where the proposed 220 KV line near Orton will pass over a branch of the Opoutia wetland. The transmission line has had to be routed over this wetland due to land access constraints. Because bitterns are not agile flyers, and often fly at night, they will be at risk of collision where the line passes over the wetland at Opoutia. The chance of line-strikes occurring has been assessed as a moderate-level risk.

The other finding from the Ecological Report is that water abstractions associated with the project, during the construction phase, could potentially exacerbate existing problems with high water temperature in streams. Existing high water temperatures are attributed to a lack of existing vegetative cover along stream margins and low rates of flow. Removal of water for construction purposes will further reduce these flow rates.

The remaining potential ecological impacts assessed in the report were found to be either not significant or able to be directly avoided, remedied or adequately mitigated during the design, construction and operational phases. Strict cleaning procedures for vehicle cleaning and ongoing weed control, for example, will minimise the risk of spread of existing weeds and the introduction of new weed species within the existing natural areas.



## 4. OFFSET MITIGATION FOR LOSS OF NATIVE BUSH

A break-down of predicted scrub and forest clearance associated with turbine site, access road and transmission line development is shown in Table 1 below<sup>3</sup>.

**Table 1 : Predicted Bush & Scrub Clearance (m<sup>2</sup>)**

BLOCKS		small-leaved scrub (m <sup>2</sup> )	small-leaved broadleaved forest (m <sup>2</sup> )	exotic scrub (m <sup>2</sup> )	advanced secondary conifer-broadleaved forest (m <sup>2</sup> )	Total per Block (m <sup>2</sup> )
A-Block	platform	0	2,727	0	0	2,727
A-Block	track	3,964	25,996	0	0	29,960
C-Block	track	17,963	7,457	0	8,438	33,858
C-Block	platform	5,938	0	0	1,763	7,701
H-Block	track	27,992	15,484	18,816	31,545	93,837
H-Block	platform	1,479	1,500	4,442	10,647	18,068
Total per Vegn Type		57,336	53,164	23,258	52,393	186,151
					Total without Exotic (m <sup>2</sup> )	<b>162,893</b>

In addition to the figures in Table 1 there will be a further estimated 9.1 hectares of clearance, topping or thinning of trees required around some of the turbines in the A, C and H turbine clusters. This will be to bring the level of surrounding vegetation down to turbine base level. Another 2 hectares will also be cleared or topped around turbines C014 and H004 to bring some of the canopy level down to about 10 metres above turbine base.

Altogether, inclusive of topping / thinning, the total amount of clearance equates to about 27.4 hectare of bush and scrub clearance (16.3 + 11.1 hectare). Of this, about 17.4 hectare is bush and 10 hectare is scrub (manuka / kanuka predominant). The three off-set mitigation techniques recommended by Kessels & Associates for dealing with the loss of native bush and scrubland are:

1. *Facilitating and assisting with funding of the legal protection of as many of the presently unprotected nature features as possible on private land within the Waikato Wind Farm; and*
2. *Intensive pest control. In addition to EW possum control, additional professional and ongoing control of feral goats, pigs, feral cats, stoats and rats would yield significant gains in habitat quality for indigenous birds such as tui, kereru and along the coast – banded dotterel, Caspian tern, NZ dotterel and variable oystercatcher nesting sites.*
3. *Retirement and restoration of semi-grazed pastureland and gorse areas between the existing bush areas and the coast within Te Kotuku Bush.*

<sup>3</sup> As provided by Kessels & Associate, June 2008.

## 4.1 BASELINE TARGETS

For the purpose of the following assessment we will assume that all of the bush and scrub that will be cleared or trimmed for the project is regionally significant vegetation (irrespective of whether it is mature bush or scrub). Bush ‘topping / lowering’ will also be regarded as the same as bush clearance.

We will also assume that in addition to the direct clearance of bush there will be damage and change to vegetation composition through ‘edge effect’. In this case the extent of the damage is assumed to be equivalent in area to the number of hectares of native bush (excluding scrub)<sup>4</sup> that is actually cleared. That is, for every hectare of mature bush directly felled it is assumed, for the purpose of the current assessment, that there will be another 1 hectare of damage caused by wind exposure along the newly-cut bush edge.

Altogether this gives a total of about 44.8 hectares as the ‘area of damage’ and baseline target for off-set mitigation (comprising 27.4 hectares cleared or thinned + 17.4 hectares assumed to be damaged by edge effect<sup>5</sup>). For the purpose of the following assessment we will further assume that all of this damage, whether felling, topping / lowering or edge effect is equivalent in severity to total clearance<sup>6</sup>.

The loss of the 44.8 hectares in turn is assumed to translate in to a reduction in carrying capacity for native birds etc in the bush as a whole. As an example, and in the case of kereru, if the average carrying capacity of the forest is assumed to be about 0.5 kereru per hectare<sup>7</sup> then the loss of 44.8 hectares would mean that the forest as a whole is able to support about 23 fewer of these birds. A possible ‘baseline’ target for off-set mitigation for the clearance of this bush would therefore be to achieve an effective replacement of this number of kereru either by enhancement of existing bush habitat or creation of new habitat.

## 4.2 OFF-SET MITIGATION OPTIONS

### Pest Control as Off-set Mitigation

Increased pest control can be used to compensate for the loss of this habitat. Clearly, the more that numbers of possums, rats, mustelids (stoats, ferrets and weasels), goats, pigs and/or deer are able to be reduced, the greater will be the recovery of native species – both plant and animal.

There are, however, many different forms, scales and intensities of pest control and it is necessary to be clear on the types of pests that should be targeted and the intensity of effort envisaged. Each pest species requires a different management strategy and may require very specialised and targeted methods of control.

Any pest control work would also need to tie in with the existing possum control programme run by the Waikato Regional Council in this part of the Region. The Council’s programme extends over the whole of the wind farm area and is aimed at achieving a

<sup>4</sup> Scrub is a forest-edge vegetation type and therefore already adapted to edge effect.

<sup>5</sup> ‘Edge effect’ value excludes scrub.

<sup>6</sup> Note that an increase in forest edge vegetation is not always entirely adverse. For some species it will be beneficial. But for simplicity, and to ensure that all estimates are reasonably conservative, a wholly adverse effect has been assumed.

<sup>7</sup> Powlesland, R.G.; Barraclough, R.K. (2001) *Proceedings of a Workshop on Distance Sampling, Wellington, May 2000. Conservation Advisory. Conservation Advisory Science Notes No. 329, Department of Conservation, Wellington.*



residual trap catch (RTC)<sup>8</sup> of about 5% or less over all of this land. The beneficial effects of the programme can already be seen in areas such as Te Umukaraka Bush.

The existence of this programme means that there is probably not a lot more that can be done specifically in relation to the control of possums in the wind farm area. An RTC target of 5% is already quite low and would not be helped significantly by providing additional funding for even lower targets to be achieved. In practice, the Council contractors are likely to be getting as low as RTC's of 2% anyway. The Council also have maintenance control work reasonably well covered by existing contracts.

We therefore would not recommend attempting additional possum control work in the area as this would currently only duplicate what the Regional Council are already doing.

An alternative mitigation option would be to focus on goats, pigs and deer. Goats are abundant throughout the area and could be a useful pest to target. The culling of goats is also reasonably likely to be supported by local landowners. But with pigs and deer there could be resistance from the local recreational hunting community (including landowners<sup>9</sup>), and ill-feeling toward the wind farm project, if large-scale culling occurred. There is reported to be a very strong and strident hunting fraternity in the Port Waikato area<sup>10</sup>.

Mustelids are another possible target but would be a very expensive and labour-intensive pest to control. These can be knocked back with pesticide (relying on secondary poisoning) and might potentially be controlled in this way for short periods of time such as during the bird nesting season. This is in fact the approach taken by Environment Waikato for the Hamilton Halo project. Their main focus is on rats and possums, which they consider to pose the greater risk to tree-dwelling birds such as tui and kereru, but also get a mustelid and feral cat bi-kill if using toxins such as brodifacoum or 1080. But for long term continuous control of mustelids (usually in places where the aim is to specifically protect ground-birds) it is usual to resort to the use of traps.

This would be a major undertaking if attempted across large areas of bush. Te Umukaraka Bush, for example, is 785 ha in size. This is about the same size as Boundary Stream Mainland Island Reserve in Hawke's Bay in which there is an existing mustelid control programme. Boundary Stream is about 700 ha and requires a network of approximately 570 fenn traps. These traps have to be checked and re-baited with fresh eggs or rabbit meat on a fortnightly basis.

Rats are likewise a high-cost target requiring similarly labour-intensive work. In a short-duration rat control programme in the Wenderholm Reserve (a 55 ha reserve near Auckland) in 1992-93, during the main bird nesting period, rat baits were laid in bait stations in a grid pattern across the whole of the reserve in a 50m x 100 metre spacing. The baits were checked and replenished twice a week for the first two weeks (when bait take is highest), then weekly for the next 8 weeks, and fortnightly thereafter<sup>11</sup>. This level

<sup>8</sup> Residual Trap Catch (RTC) is a measure of the number of possums caught per 100 trap-nights and indicates possum population densities. Possuming contractors are usually required to achieve a specified RTC. 5% is a common target but contracts may require an RTC as low as 1% in some cases.

<sup>9</sup> In some cases this will include multiple landowners. The Kotuku block, for example, is multiply-owned Maori land. Any one of these owners could potentially object to the culling of deer or pigs on the property.

<sup>10</sup> Pers comm. Regional Council Animal Pest Control personnel.

<sup>11</sup> *New Zealand Journal of Ecology* (1995) Clout, M.N et al. *Breeding Success of New Zealand Pigeons (Hemiphaga Novaeseelandiae) in Relation to Control of Introduced Mammals*. p.210.



of intensity of control work is feasible for relatively small and easy-access bush areas, such as Wenderholm, but would be a massive undertaking in the likes of the Umukaraka or Kotuku bush block (785 ha and 285 ha respectively). Environment Waikato work on the basis of about \$200 per hectare for the Hamilton Halo project.

Possum, rat and mustelid control nevertheless all have direct benefits for native fauna. On Kapiti Island the removal of possums in the early 1980's resulted in more or less a doubling in the number of birds per hectare and six-fold increase in the number of kereru<sup>12</sup>.

At Boundary Stream Mainland Island Reserve in Hawke's Bay an intensive possum, rat and mustelid control programme has seen the kereru population in the reserve increase to about 3.13 birds per hectare, as compared to 1.72 kereru per hectare in a local control area<sup>13</sup>. In fact the number of birds in the control area is thought to have been artificially boosted by over-flow from the reserve. The 'true' control level may be closer to 0.5 kereru per hectare<sup>14</sup>. If so, this would translate to about a six-fold increase in kereru numbers, the same as on Kapiti Island.

In Wenderholm Regional Park in 1992-93 the short term rat control programme referred to above (which also probably simultaneously killed an unknown number of possums<sup>15</sup> and stoats) over the spring and late summer nesting period resulted in a 50% nesting success-rate for native kereru. This is similar to the nesting success of kereru on predator-free off-shore islands. By contrast, in the five years prior to this operation at Wenderholm every one of the 27 monitored nests had failed at the egg stage, with about two-thirds of all eggs being taken either by rats, stoats or unknown predators.

In the Tongariro Forest Conservation Area in 2006 an aerial 1080 poisoning operation which resulted in a large scale knock-down of possums, rats and stoats immediately thereafter saw a doubling in the survival rate of fantail and tomtit chicks, five times increase in kiwi chick survival, and tripling in the chick survival rate for blue duck<sup>16</sup>.

From these results it would not be unreasonable to expect that if a rat and stoat control programme was carried out somewhere in the wind farm area there would be at least a 50% increase in nesting success for native birds (varying from species to species) and, for kereru specifically, at least a doubling of the number of birds per hectare in the treatment area.

If so, then to achieve the 23 kereru 'replacement' target, mustelid and rat control would need to be carried out across an area of bush equivalent in size to that currently occupied by this number of birds (44.8 hectare).

Note that this is probably a conservative figure. It takes no account of probable over-flow of young birds from the pest control area in to other surrounding bush. It is also based on reasonably generous assumptions as to the quality of bush that will be lost as a result of the clearance of 27.4 hectares of native vegetation (in this case all of the bush is assumed to be fairly mature forest). It also assumes that all of the 'edge effect' around the areas of

<sup>12</sup> T.L. Montague (2000) *the Brushtail Possum : Biology, Impact and management of an Introduced Marsupial*. p.245.

<sup>13</sup> Department of Conservation (June 2005) *Boundary Stream Mainland Island 2003-2004 Annual Report*. p.32.

<sup>14</sup> Pers. comm. John Adams (Programme Mgr Biodiversity Assets, Dept Conservation, Hawke's Bay Consncy).

<sup>15</sup> There has also been an on-going possum control programme in the reserve. Possums were already at low numbers at the time of this experiment.

<sup>16</sup> From DoC press release (14 August 2007) *1080 boosts kiwi population in Tongariro Forest*.



physical bush clearance is equivalent in effect to complete clearance and that these edges are of no value to kereru.

As regards the figure of 44.8 hectares it is also important to understand that this assumes a stand-alone area of bush rather than part of a continuous expanse of forest. It would not be practical to carry out intensive pest control in places where the operational area can be freely re-invaded from all sides. For example, to try and control stoats and rats in just 44.8 hectares of Te Kotuku Bush while leaving the remaining 235 hectare untreated. The 44.8 hectares is therefore only a theoretical figure. Our intention here is not to identify a specific area of bush where pest control ought to be carried out but rather to calculate the size of area of bush that would be required to achieve a fair exchange for the felling of the 27.4 hectares.

The current (2008) cost of a mustelid and rat control programme over an area of 44.8 hectares is estimated to be about \$22,000 per annum. Environment Waikato advise that, from their experience with the Hamilton Halo project, the cost of a rat (and possum) control programme over an area of 50 hectares would be about \$10,000 per annum (\$200 per hectare)<sup>17</sup>. Enquiries with the Department of Conservation suggest that for mustelid control the cost would be between \$9,000 and 16,200 per year<sup>18</sup>. Assuming that the two control programmes were run together by a single contractor, and assuming that possums are already largely under control, then a total combined cost of about \$22,000 per annum would be reasonable to assume.

### **Land Retirement & Restoration as Off-set Mitigation**

An alternative to pest control would be to facilitate the retirement and restoration of native habitat in replacement for the 27.4 hectares of bush and scrubland that will be cleared.

It is difficult to accurately determine what a 'fair exchange' would be in replacement of this 27.4 hectare as that will depend in large part on the potential ecological value of the area to be retired. It will also depend on what kind of additional restoration work might be envisaged for the retired land. This could be anything from simply leaving the area to naturally regenerate through to carrying out large scale native plantings. It will also depend on whether additional pest control is anticipated for protection of the emergent bush.

The logical places to retire and restore to native vegetation would have to be in the same general area as where the proposed bush and scrub clearances will occur. They should also ideally be either a natural continuation of an existing bush block or separate area of special ecological value.

In area, a 'fair exchange' would require a parcel of land of at least the same size as the 27.4 hectare to be cleared. This could be doubled (to about 55 hectare) to account for the wider area of damage and change of vegetation, through 'edge effect', around the area that is directly cleared. Doubling the area also takes some account of the fact that the land may be of lesser ecological value than the land to be cleared (at least until such time as regeneration of the retired area is complete).

<sup>17</sup> Pers. comm. Ben Parish, Environment Waikato. Estimate assumes approx 75m x 75m spacing of bait stns.

<sup>18</sup> Pers. comm. Dave Carlton, Dept of Conservation Hawke's Bay Conservancy. Estimated cost assumes between \$10 and \$20 per hectare per trip by the contractor to replace baits with monthly visits in winter and fortnightly visits for 6 months over summer.



A possible candidate would be the strip of semi-grazed pasture and gorse country in between Te Kotuku Bush and the coastline. This is one of the areas that has been specifically recommended in the Ecological Assessment as ideal for retirement and restoration. The area of land involved is about 40 hectare in size. If this area was allowed to regenerate it would, in the long term, provide an ecologically significant coastal bush environment graduating from the hill-top down to the sea. The retirement and restoration of this land would, however, be entirely subject to landowner approval.

If the land was retired, and presumably covenanted, then this could be done either at no cost (as the land would still remain in its existing private ownership) or by way of payment of compensation for the loss of productive potential. Given that the land is only semi-grazed, and currently reverting to gorse and scrub, the lost productive potential would not be very high – at least compared with fully developed farmland. The opportunity cost associated with permanently retiring it (with no change of ownership) is estimated to be in the order of \$100,000.

If effort was then put in to scattered native planting and pest control (focussing mainly on goats and pigs) a further set-up budget of \$100,000 might be allowed. The total cost of retirement of the 40 hectares is therefore estimated to be around \$200,000. If the total area to be retired was increased to 55 hectares then the overall cost would increase proportionately to about \$280,000.

### **Legal Protection as Off-set Mitigation**

Legal protection is not a mitigation measure in the same sense as either pest control or bush restoration although it supports these initiatives by ensuring that future owners of the land are not able fell the bush and thereby ‘undo’ the benefits of this work. Recall that all of the bush is privately owned and incorporated in to existing operational farms and could therefore be cleared for pasture or other productive use at any future time – notwithstanding current efforts to minimise the effects of the wind farm. It is these future potential land uses, rather than the effects of the wind farm, that legal protection addresses.

Nevertheless, if legal protection was secured for one or more significant area of bush in the wind farm area then this would be a positive environmental outcome for the project if it is assumed that, without protection, that area of bush would have been liable to be cleared.

However, the difficulty is that we can not really know whether such clearance would have otherwise occurred. It is therefore difficult to set a baseline target for legal protection. For this reason we do not propose to suggest a baseline. Rather, any legal protection that can be secured should be regarded as only a useful extra in terms of environmental compensation for the project as a whole.



## 5. OFF-SET MITIGATION FOR TURBINE STRIKE

The Ecological Assessment predicts that there is a low to moderate risk of turbine strike for kereru and migratory waders but low risk for other bush birds and for bats. This prediction is based on experience elsewhere in New Zealand and overseas and on assessments of the likelihood of the turbines standing in the path of migratory waders. The analysis of this issue is detailed in Sections 4.4 and 4.5 of the Ecological Report.

The report notes that the Brooklyn Turbine in Wellington, which is less than 20 metres from the Karori Wildlife Sanctuary, and which has now been operating for more than 10 years, has no history of native bird strike. Nor have there been any recorded fatalities of native birds on either the Hau Nui or Tararua wind farm sites. There is also evidence that local populations of some species of birds in wind farm areas learn to actively avoid turbines.

Although there is no record of kereru having been killed by turbine strike at any of the existing New Zealand wind farms there is, however, concern that juveniles or displaying adult birds could potentially be at risk. A 'low to moderate' risk assessment has therefore been assumed in the Ecological Assessment.

The 'low to moderate' risk assessment for migratory waders reflects the lack of observational data, and therefore lack of certainty, on the migratory flight behaviour of these birds. Logic suggests that they will fly along the coastal cliff line (close to, but clear of the nearest turbines) and that cross-country flights to the Firth of Thames are most likely to start from either Raglan or Port Waikato (also avoiding the wind farm). Further monitoring is however required for this assessment to be confirmed.

The risk to long-tailed bats is also uncertain although no bats have actually been found in the area so far and it is therefore unclear whether or not they are present. The Ecological Assessment concludes that they are likely to be present but that numbers are probably low. This, combined with current understandings as to the flight behaviour of long-tailed bats, suggests that the risk to bats of collision with wind turbines is also low. The report nevertheless recommends a post-operational monitoring programme. If the monitoring finds that bat strike is not an issue then no specific mitigation will be required. But if monitoring shows that bat strike *is* significant then the following direct and off-set mitigation options are recommended<sup>19</sup>:

1. *Increasing the echolocation reflectance of rotor blades.*
2. *Habitat improvements at locations away from the turbines.*
3. *Funding off-site habitat and breeding enhancement programmes.*

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<sup>19</sup> Kessels & Associates (2008).



## 5.1 BASELINE TARGETS

If turbine strike is to occur then a possible off-set mitigation approach would be to direct funding to projects that facilitate improved breeding and/or survival of birds or bats of the particular affected species. This funding would need to be sufficient to ensure that the outcome was a more than equal replacement of the number of individuals killed.

One approach would be to actively monitor for bird strikes and then provide off-set mitigation in compensation for the loss of birds that are killed. An appropriate baseline target could be, for example, a ratio of 10 'replacement' birds for each bird fatality. This high ratio acknowledges that for any bird fatality discovered there could be others not found (particularly with small birds such as wrybill). It also acknowledges the statistical uncertainties of measuring bird replacement and, lastly, incorporates a penalty and therefore incentive for future avoidance of this effect.

An alternative approach is to assume that small numbers of birds (specifically migratory birds and/or kereru) *will* be killed by collision with wind turbines but that the numbers will be so small, and strikes so infrequent, that no dead birds are ever found. With this method we might assume, as a 'sub-detection' rate, somewhere in the order of 0.01 collisions per turbine per year (this is from the bottom end of the range of bird mortality rates reported by Kessels & Associates from turbine sites internationally where turbine strike has been known to occur<sup>20</sup>).

If this was the case at the Waikato wind farm, and if there are 180 turbines, and all turbines are assumed to pose an equal risk irrespective of their individual location<sup>21</sup>, then the total annual bird strike would equate to about 1.8 strikes per year. If a 10x 'replacement ratio' is then assumed (as allowance for uncertainty) then the off-set mitigation target would be to achieve a population supplement equivalent to 18 birds per annum. Note that these would be 'hypothetical' birds of no particular species – although it is suggested that a migratory wader species (or waders in general) would probably be the most appropriate to assume and adopt in terms of effort spent on off-set mitigation.

The two approaches could alternatively run in tandem – with compensation required for known bird strike fatalities (using a 1:10 replacement ratio) but a sub-detection strike rate of 0.01 strikes per turbine per annum being assumed if no fatalities are found. The suggested strike number of 18 birds per annum in this case also includes a 10x multiplication factor as further allowance for uncertainty.

For bat strike a baseline off-set mitigation target is even harder to calculate. But if we assume that there are bats in the area (this is not unlikely but yet to be proven), and if any area of bush is assumed to potentially harbour bats, and if there are about 40 turbine sites either in or near bush or scrubland, and the potential rate of bat strike is taken to be the same as for 'hypothetical' birds, as above (i.e. 0.01 collisions per turbine), then the number of bat fatalities could be in the order of 0.4 bats per year (or one bat per 2½ years). Applying the same 'replacement ratio' of 10 to 1 then gives a baseline target of 4 replacement bats per year.

<sup>20</sup> Kessels & Associates (2008).

<sup>21</sup> In reality not all turbines will present the same risk. For migratory waders the risk is likely to diminish with distance from the shore. 155 of the 180 proposed turbines will be more than 500m from the coastline.



Again, this calculation is made on the assumption that there are no bat fatalities actually recorded in the post-operational period for the wind farm. It assumes that strikes are nevertheless occurring at a very low rate but that these are simply too few in number to be reliably observed.

The alternative is to provide mitigation only in the event that bats are actually killed and to apply (as above) a multiplication of, say, 10 replacements for every 1 verified bat strike fatality. As with the assumptions for bird strike, this higher ratio reflects the possibility of there being more strikes than actually detected and also includes an element of penalty and therefore incentive for future avoidance of the effect.

## **5.2 OPTIONS TO AVOID, REMEDY OR MITIGATE**

### **Strike Avoidance Strategies**

If the further proposed migratory shorebird monitoring programme determines that there is in fact potential for significant adverse effects on particular populations of migratory bird then early warning techniques such as the use of radar could be an option. It may, for example, be feasible and effective to detect migratory bird flocks with radar and have a system whereby particular turbines are slowed or stopped until such time as it is calculated the migrating flock has passed.

### **Bird Species Recovery as Off-set Mitigation**

Alternatively, in the event that off-set mitigation is required for bird strike then the specific details of the type of mitigation, and associated costs, will depend on the needs of the individual species. This may mean targeted predator control or habitat enhancement (planting, fencing or weed-clearing) but could equally mean, for example, funding research and monitoring.

The best opportunities for off-set mitigation may even be at some distance from the wind farm area. With wrybill, for example, the breeding area for this species is along the inland shingle river beds of the South Island. This is where the species is currently most at risk (from predation) and where mitigation funding, if required, would probably be more effectively spent in order to boost wrybill numbers. Wrybill, along with other wader species, also congregate on the Firth of Thames and Manukau Harbour. These would be other possible sites for funding wader recovery work.

For the purpose of the current assessment we will, however, assume that effort is put in to the control of predators (e.g. stoats, ferrets, weasels, cats<sup>22</sup>, rats and hedgehogs<sup>23</sup>) in somewhere like the wrybill's South Island breeding area or at Miranda on the Firth of Thames. We will also assume that the minimum target for 'additional' birds (birds that would otherwise have been lost to predation) is 18 per annum. The target birds may be either waders or kereru.

<sup>22</sup> Battley, P. & Moore, S. (2004) Notoris: Journal of the Ornithological Society of NZ, vol 51, p. 233 – 234 found the remains of at least 6 wrybill, 3 w/ fronted terns and 1 w/ oystercatcher – all evidently killed by a single cat.

<sup>23</sup> In the South Island hedgehogs are the single-greatest predator of wrybill eggs.



This number of replacement kereru could be provided by extending the predator control work described Section 4. Another 18 'replacement' kereru would cost about \$17,000 per annum in terms of the additional predator control required.

In the case of wading birds the same number could theoretically be saved from predation even by the killing of a single stoat or feral cat in a key wading bird area. It is hard to say how much effort would be required to achieve this outcome although statistics from Boundary Stream Mainland Island suggest that the mustelid control programme there has a strike rate of about 1 mustelid killed per annum for every 5 traps maintained<sup>24</sup>. For our purposes we could assume, more conservatively, that four times this amount of trapping effort (20 traps) will be required to achieve the same result. We may also assume additional effort in the form of occasional hunting using trained stoat or cat-hunting dogs.

The maintenance of 20 mustelid or cat traps plus hunting effort (assuming about 3 or 4 hunts per year), if carried out by a locally-based paid contractor would probably cost no more than about \$7,000 per annum.

Note that for the migratory wader birds it is, however, considered appropriate that the exact type and strategy, if any, to avoid, remedy or mitigate not be determined until the proposed monitoring programme and associated risk assessment is completed.

### **Bat Recovery as Off-set Mitigation**

We have assumed 0.4 bat fatalities per annum, and a replacement target of 4 bats per annum, irrespective of whether any fatalities are in fact observed or even occur (or indeed whether or not there are bats actually present in the area).

Alternatively, if bat fatalities *are* found to occur then a multiplication rate of 10 : 1 'replacements' per number of bats known to be killed is suggested as an off-set mitigation target. These targets would most likely be achieved by one or both of the methods recommended in the Ecological Report, namely:

- *Habitat improvements at locations away from the turbines.*
- *Funding off-site habitat and breeding enhancement programmes*<sup>25</sup>

Predation by rats, stoats and cats is suspected of being one of the major threats to New Zealand's native bats<sup>26</sup>. Habitat improvements could therefore potentially focus on reducing predator numbers in specific areas (away from the turbines) and providing predator-proof roosts. Breeding enhancement programmes may potentially include captive breeding (although techniques for captive breeding are yet to be developed) or captive raising and translocation of juveniles.

There are, however, too many gaps in our knowledge of bats to even guess at the scale of predator control that would be necessary to make a significant difference to local populations. Little is known about specific mortality rates due to predation in the wild. It is therefore difficult to quantify what difference would be made by predator control work

<sup>24</sup> Refer to Boundary Stream 2003 – 2004 Annual Report

<sup>25</sup> The Ecological Report also recommends increasing the echolocation reflectance of rotor blades as a possible solution if bat strike is found to occur. This is a valid suggestion but not an off-set mitigation measure and therefore not directly relevant to the present report.

<sup>26</sup> Refer: Department of Conservation (1995) *Bat (Pekapeka) Recovery Plan*, p.7.



and what amount of control work would be required to save, as a baseline target, the equivalent of 4 bats per year. It might involve as little as providing and maintaining a network of predator-safe bat roosts, or finding and protecting existing roosts, or a more ambitious and extensive programme of predator control.

If predator control is called for then this could potentially tie in with the mustelid and rat control work outlined in the preceding section as a potential mitigation option (over an area of 70 hectares) for clearance of the 27.4 hectares of bush. But in the absence of quality data the best approach to quantifying a 'fair exchange' for potential bat strike may be to simply focus on supporting the work of existing bat research and recovery programmes and to provide what would reasonably be considered a significant contribution to this work. A suggested figure is \$50,000 per annum over a research period of 5 years.



## 6. OFFSET MITIGATION FOR TRANSMISSION LINE STRIKE

Kessels & Associates have predicted that there will be a risk of Australasian bitterns colliding in to the section of 220 KV transmission line proposed to be built across a branch of the Opoutia wetland. The transmission line is proposed to be routed across the wetland due to land access constraints on other possible alignments. The Ecological Assessment predicts that there is a moderate-level risk that bittern strikes will occur. Bitterns are slow, heavy flyers and often fly at night. This makes them potentially susceptible to collisions with power lines.

The Australasian bittern is a large, stocky bird of the heron family, mottled brown in colouring, up to 75 cm in length, and found in New Zealand, Australia and New Caledonia. The world population is estimated to be somewhere between 2,500 and 10,000 adult birds including about 600 – 700 in New Zealand. The population is believed to be declining. In December 2006 the Australasian bittern was re-listed in the IUCN Redbook from ‘vulnerable’ to ‘endangered’.

Bitterns live in wetland habitats. Their diet includes frogs, fish, eels, snails, insects, mice, kura, young birds, leaves and fruit. Nests are typically constructed as flat open platforms, built among the reeds, with 4 – 6 eggs laid per clutch. The reason for the decline of this species is not accurately known but thought to be due to a combination of causes including mainly loss or damage of wetland habitat (through drainage, clearance, stock trampling or fire) and predation (in NZ by ferrets, stoats, cats, dogs and possums). A world-wide collapse in frog populations, due to the spread of the fungal disease chytridiomycosis, may also be indirectly impacting on bitterns as one of their known sources of food. Collision with power lines is likely to be a comparatively minor problem but significant in the context of the increasing rarity of this species.

### 6.1 BASELINE TARGETS

The behaviour and habits of the Australasian bittern are as yet poorly understood. It is a secretive bird, active mainly at night, and little-studied. Line-strikes involving bitterns are known to occur but recorded instances are rare and quantitative data completely lacking. The number of collisions likely to occur over the Opoutia wetland, involving bitterns, is therefore very difficult to quantify.

We can, however, assume that collisions are by no means a common occurrence. Enquiries by Kessels & Associates, in discussion with other ornithologists, have so far produced evidence of only one previous known case of collision with power lines involving an Australasian bittern<sup>27</sup>. Enquiries have also been made with the Native Bird Recovery Centre in Whangarei<sup>28</sup>. The co-founder of the Centre, Mr Robert Webb, who has 20 years experience in the treatment of injured native birds, said he had never heard of any cases of Bitterns flying in to power lines.

Although this is only a sample (albeit among experienced observers) it does at least suggest that line-strikes involving bitterns are a rare event. It is acknowledged that for every ‘known’ bird strike there will be others that go un-noticed and unrecorded. But it is

<sup>27</sup> Pers comm. G Kessels.

<sup>28</sup> Pers comm. telephone interview (M. Tonks / Robert Webb).



relevant that among experts only one known line-strike fatality can actually be identified over a period of about 20 years.

On this basis, and for the purpose of the current assessment, it would therefore not be unreasonable to assume a rate of bittern-strike, involving the proposed transmission line crossing at Opoutia, of no more than 1 bird every 5 years. This is a rough but, in our opinion, conservative estimate given that (a) the so-far known record of bittern strike consists of just one individual; (b) the experience of the consulted ornithologists extends back over a period of about 20 years; (c) there are many thousands of kilometres of transmission, local power and telephone lines in New Zealand including lines through, near or between wetlands inhabited by bitterns yet there is no evidence that bittern-strike is a problem that widely occurs; (c) in comparison the proposed transmission line over a branch of the Opoutia wetland constitutes less than 500 metres of line; and (d) the assumed strike ratio of 1 bird every 5 years represents four times the so-far known record of strikes anywhere in the country – with all of these assumed to be occurring on the proposed 500 metres of line over the Opoutia wetland.

Note also that the adopted strike-rate assumes there is no other mitigation to prevent bittern-strike or that any mitigation that is used proves ineffective. Where the line crosses over Opoutia wetland it may be possible, for example, to install line-markers or ‘bird flappers’ to make the lines more visible to bitterns flying at night. Although line markers and bird flappers have never been tested on birds in a New Zealand setting, overseas research shows that these types of measures are effective in significantly reducing bird-strike mortality among cranes and storks – with these birds being comparable to the bittern in terms of flying agility and size. If indeed the problem of line-strike is specifically associated with bitterns flying at night then white or luminescent markers on the line might practically eliminate the risk.

If, however, there are no line-markers, or these markers do not work, then the off-set mitigation baseline target, as recommended in this report, would be to achieve an improved rate of survival and/or reproduction in the Australasian bittern population equivalent to at least 1 more bird every 5 years.

Kessels & Associates have suggested that off-set mitigation could be provided either by way of predator control or through contributions to bittern research.

## **6.2 OFF-SET MITIGATION OPTIONS**

### **Predator Control**

A lack of New Zealand research means that there is little specifically known about predation risks affecting Australasian bitterns in this country. It is only assumed that, like other native birds (especially ground-dwelling birds), they are susceptible to the usual predatory mammals – namely ferrets, stoats, cats, dogs, possums and rats. But the significance of predation relative to other problems such as loss of habitat or food sources; the main types of predators; and whether these mainly target adults, chicks or eggs, are all unknown.

Nevertheless, with bitterns laying clutches of 4 – 6 eggs a year it would not require much of an increase in annual nesting success, and the survival of these chicks in to adulthood, to achieve the baseline target of one more bird every 5 years. The successful hatching and



survival of a single clutch of eggs that otherwise would not have survived, once every 25 years, would effectively achieve this.

In this case we assume that the most practical approach would be to carry out targeted predator control around one or more known nest sites. Nests would first of all have to be found. Traps and poison baits would then be laid and maintained within a radius of about 50 metres around each nest.

If trapping and poisoning was carried out over, say, 5 nesting seasons (October – January), there would have to be a reasonable chance that at least one clutch of eggs that would otherwise have been predated upon in that period would survive to maturity – if indeed predation is a significant population constraint for Australasian bitterns. The survival to maturity of just two more clutches of eggs/chicks over that 5 year period would exceed the assumed loss of 7 bitterns due to line-strike over the Opoutia wetland 35-year term of consent of the wind farm project.

The cost of this exercise is estimated at about \$7,000 per annum over 5 years. This includes time required for the location of nests and maintenance of traps and poison baits for a period of about 4 months a year (October – January).

### **Bittern Research**

An alternative to funding pest control would be to focus instead on bittern research. This is, in fact, where the greater need probably exists. While predation is almost certainly a problem for bitterns we do not know if this is actually the main reason for their decline in New Zealand. There are several other possible factors including loss or damage to habitat, decline in prey species (e.g. the decline in frog numbers or eels), or mortality through disease.

It would be more valuable to work out what is actually happening to the bittern, so that lessons learnt can be applied to the recovery of the species nationwide, than to concentrate on improving the likelihood of survival of just a small and localised cluster of individuals.

It would be particularly useful to know what Australasian bitterns in New Zealand feed on throughout the year, and the reliability of these food sources, and also to find out what specific threats these birds face in terms of predation. Research in to the patterns of movement of bitterns (using radio transmitters) would also be helpful.

This kind of research would be suitable for as university scholarship project for which funding in the order of, say, \$20,000 per annum over 3 years would probably be sufficient.



## 7. OFFSET MITIGATION FOR WATER ABSTRACTIONS

During the 5-year construction period there will be a demand for water (for concrete batching and dust control, and as potable water) at a rate of up to 300m<sup>3</sup> a day across the wind farm construction area as a whole. About two-thirds of this will be for dust control purposes. Water usage will be intermittent but if taken on a continuous (24 hour) abstraction basis 300m<sup>3</sup> would equate to about 3.5 litres per second. Details of usage are as set out in the Water Supply Assessment<sup>29</sup>.

The water will be taken from four streams (the Waikawau, Kaawa, Waikaretu and Waikorea). Each of the respective streams will be used depending on their proximity to the place of work at any given time and abstractions will be limited to 10% of the five year low flow minus other authorised takes in the catchment<sup>30</sup>. The maximum rate of abstraction from the identified stream sources will be between 0.9 and 1.2 litres per second. In order to meet peak demand it will therefore be necessary at times to draw from more than one source and to rely on water held in storage.

Abstractions will cease when the flow rate, as measured on the Naaik Stream, is less than 90% of the five year low flow (being the environmental flow prescribed by the Proposed Waikato Regional Plan). If this procedure is followed the effect on instream ecology will be very minor. That minor effect will be a fractional increase in instream water temperature on hot summer days (due to the slight reduction in thermal mass).

But while minor in itself, any small increase in temperature will add to already high summer water temperatures in most of the streams in the wind farm area.

The existing high water temperatures are mainly due to the lack of riparian cover (tall grasses, scrubs or trees that over-shadow the water) as the streams pass through predominantly open pastoral landscape in which animals are able to graze right to the water's edge. The Ecological Report therefore recommends riparian planting as a way of shading and therefore cooling the stream water. Plantings would also have the added benefit of providing terrestrial food sources for fish and organic carbon inputs.

### 7.1 BASELINE TARGETS

It should be emphasised that the scale of effect of the abstractions on water temperature will be very minor. There is, in fact, a good case to be made that no off-set mitigation should be required at all. The real problem is not the abstractions but the lack of riparian cover along streams in the wind farm area. The effect of the abstractions will be negligible in comparison.

But if the intention is to off-set all effects, however minor, then some allowance could be made for the off-setting of the effect of these abstractions on local streams. The mitigation may also include a consideration of the possible risks of increased sediment loading due to run-off from earth-moving activity associated with the project – even though the Ecological Report concludes that providing standard good practice silt control techniques are implemented the effects on waterways will be no more than minor.

<sup>29</sup> Beca (March 2008) *Hauauru ma raki Waikato Wind Farm Water Supply Assessment*.

<sup>30</sup> This is in compliance with Rule 3.3.4.14 of the Proposed Waikato Regional Plan



## 7.2 OFF-SET MITIGATION OPTIONS

The small scale of effect suggests that any off-set mitigation work should be carefully targeted. It would not be possible to make a significant difference to stream water temperatures without extensive stream-side plantings extending over several kilometres. This amount of planting would quickly exceed the relative scale of effect of the proposed abstractions.

A better option therefore may be to work on targeted riparian plantings that serve not only to lower localised water temperatures but which serve the aquatic ecosystem in other ways. If so, the most likely choice would be to focus on riparian work (fencing and planting) near the mouths of one or more of the major streams. This would have a direct additional benefit for the local whitebait fishery. Whitebait spawn among tidally submerged reeds, grasses and other vegetation at the mouths of streams and rivers between the mouth and the upstream extent of the saltwater wedge. These spawning areas (and the eggs themselves) are easily destroyed by grazing stock.

The greater priority would be for fencing (typically about 3 metres back from the water edge). This would at least allow tall grass to grow and create an improved whitebait spawning habitat. Planting within the fenced-off area would then further enhance this habitat. Recommended species for planting include flax, kowhai, karamu, cabbage tree and ribbonwood.

Any amount of fencing and riparian planting around the mouth of one or more stream in the wind farm area would adequately off-set the small effect of the proposed abstractions – although the two streams where the greatest benefit is likely to be had are the Kawaa and the Waikorea<sup>31</sup>.

For one or both of these streams it would be a more than adequate off-set mitigation to fence off a 3 metre wide strip on both sides of the stream for the last 300 – 400 metres before the stream runs in to the beach – with or without riparian planting.

Note that any such mitigation work would be subject to landowner agreement.

It is assumed that there would be no land purchase involved with this mitigation work and that the only costs would be the fencing itself and possible planting. The cost of conventional wire fencing is currently about \$15 per metre. To fence 800 metres of stream-bank (400 x both sides of the stream) would therefore be in the order of \$12,000. Another \$20,000 might be added for planting. Total cost would therefore be about \$32,000.

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<sup>31</sup> Pers comm. G Kessels (Kessels & Associates (14/12/2007)).



## 8. COST SUMMARY & DELIVERY MECHANISMS

A summary of costs associated with each of the off-set mitigation options described in this report is as set out in the table below. Note that these are minimum off-set mitigation targets only. In arriving at the total values an annual discount rate of 10% and annual inflation rate of 3% have been assumed.

Effect	Off-set Mitigation	Cost estimate	NPV <sup>32</sup> / 35 years
Bush Clearance (27.4 ha)	<b>EITHER</b> Pest Control (over 45 ha)	\$22,000 per annum	\$311,000
	<b>OR</b> Retirement & restoration (40 ha at Te Kotuku, subject to landowner agreement, plus another 15 ha)	\$280,000	\$280,000
Turbine Bird Strike (assuming no bird strike actually recorded)	Predator control off site <sup>33</sup>	\$7,000 to \$17,000 per annum (depending whether for waders or kereru)	\$100,000 to \$240,000
Turbine Bat Strike (assuming no bat strike actually recorded)	<b>EITHER</b> Pest Control, as above (45 ha)	\$22,000 per annum	No extra if part of pest control above or \$311,000 if separate
	<b>OR</b> Bat research & conservation	\$50,000 per annum over 5 years.	\$220,000
Bittern Line-Strike	<b>EITHER</b> targeted predator control	\$7,000 per annum over 5 years	\$30,800
	<b>OR</b> Bittern research	\$20,000 per annum over 3 years	\$56,200
Increased water temp due to abstraction	Riparian fencing & planting	\$32,000	\$32,000

Depending on the options chosen, the inflation-adjusted nett present value (NPV) of all of the mitigation measures combined comes to between \$693,700 and \$919,200.

The delivery of this mitigation funding could be either by direct funding of the actions themselves (by Contact Wind) or through a new or existing community trust or via direct funding to agencies such as the Department of Conservation or Environment Waikato. If administered through a trust or other agency this would enable greater flexibility in the way that the funding is specifically used (e.g. through a contestable fund).

<sup>32</sup> Nett Present Value over a 35 year period (duration of consent) using a 10% annual rate of discount.

<sup>33</sup> Alternatively an avoidance approach such as the use of radar detection and turbine management could be employed.

Exhibit M T2

Hauaunu Ma Raki - Waikato Wind Farm : Recreation & Tourism Impact  
Report - dated June 2008

**HAUĀURU MĀ RAKI-WAIKATO WIND FARM**  
**RECREATION & TOURISM IMPACT REPORT**

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**Prepared For:**

Contact Wind

**June 2008**

**FINAL**



**ENVIRONMENTAL MANAGEMENT SERVICES**  
*Limited*

**000029**

## Executive Summary

This report presents the findings of an assessment of predicted effects of the proposed Hauāuru mā raki-Waikato Wind Farm on local recreation and tourism. The report also examines potential mitigation and enhancement options specifically relating to recreation and tourism activities. The main findings of the report are as follow:

*... no significant adverse effects on public recreation are predicted ...*

As virtually all of the land in the wind farm study area is privately owned, and as there is no formed public access to any of the 35 kilometres of coastline, there is presently very little public recreational activity or recreational opportunity for the wind farm to affect. No significant adverse effects on public recreation are therefore predicted. The only (minor) effect will be as a result of roading improvements associated with the project. Some of the tighter corners will be 'eased' to enable long loads to get through and therefore may become less challenging for rally driving – with the roads in this area being part of the now biannual Rally New Zealand event. Rally New Zealand have, however, indicated that they are comfortable with what is proposed and do not see a major problem for the event as long as there is on-going communication and co-operation in the design and timing of road works.

*... no significant adverse effects on tourism are predicted ...*

The wind farm is also unlikely to have any significant adverse effect on existing tourism activity. There are two existing tourism operations – Nikau Cave and Adventure Waikato. The owners of Nikau Cave (while acknowledged as participants in the project) have indicated that they do not see the wind farm as likely to adversely affect them. Rather, the wind farm could provide opportunity for a widening of tourist interests in the area, and for alternative tours to caving.

For the owners of Adventure Waikato there is a concern for the possible effects of construction traffic on roads used by visitors to their property. The findings of the Transportation Assessment prepared by TDG suggest, however, that there will be little cross-over between the routes used by construction traffic and routes used by traffic accessing Adventure Waikato. The exceptions to this are parts of State Highway 22 and Waikaretu Road (both of which are sealed). There are also concerns with the effect of the wind turbines on local aesthetics. This effect is acknowledged but considered not to be of sufficient degree as to materially affect the Adventure Waikato operation.

*... mitigation is not required because there will be no adverse effect ...*

In the absence of any significant adverse effect on either public recreation or tourism this report makes no specific recommendations for impact mitigation.

*... optional initiatives beyond the duty to 'avoid, remedy or mitigate' ...*

Although mitigation is not required in terms of duties under the RMA (to 'avoid, remedy or mitigate' adverse effects) there is nothing to prevent Contact Wind going beyond these duties to facilitate, through the project, broader improvements to the local recreational



scene. In this report a number of possible recreational enhancement options have been considered. Potential options include:

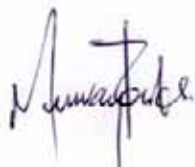

1. Establishing non-motorised public access to one or more beaches in the wind farm area (providing this does not unduly conflict with the protection of vulnerable native species including NZ Dotterel and *Hebe speciosa*).
2. Construction of one or more viewing & information platforms.

Other options that have been considered, but determined to be unviable at present, include the development of a commercial coastal walking track (on the Banks Peninsula private walkway model) and/or development of a mountain-biking circuit utilising in part the wind turbine access roads. These options are technically possible but would require a significant long term commitment on the part of the relevant private landowners to make the concept work and to keep the tracks / huts maintained. If landowners are not interested (as is probably the case at present) then the tracks etc simply will not happen or, if built, will eventually fall in to disrepair.



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## 1. INTRODUCTION

This report presents the findings of an assessment of predicted effects of the proposed Hauāuru mā raki-Waikato Wind Farm project on public recreation and tourism. Both positive and negative potential effects are considered. The study also assesses opportunities for impact mitigation and recreational enhancement.

## 2. STUDY AREA RECREATIONAL OVERVIEW

The wind farm study area runs between Limestone Downs (4km south of Port Waikato) and Te Akau South (about 12 km north of Raglan) and extends approximately 12 km in from the coast. Most of the roads are gravel and the area as a whole can be described as fairly remote. Travel distances from the main urban centres of Auckland and Hamilton are between 1 and 1½ hours. For Aucklanders the journey would be comparable to a trip to Thames, Warkworth or Hamilton. For Hamilton residents it would be the equivalent of a trip to Auckland, Thames, Tauranga or Kawhia.

There is very limited (practically non-existent) off-road public access throughout the whole of the study area and formed legal road access to any of the 35 kilometres of coastline is notably absent. Visitors driving through the area will have the experience of knowing that they are at times only one or two kilometres from the coast, and will occasionally see the coast, yet be unable to reach it. Nor are there any accessible public reserves in the area that would be suitable for walking / tramping, camping or swimming.

The landscape has patches of native bush but is otherwise predominantly pastoral. There are some points of interest for passing visitors, including limestone formations, small scenic reserves and private bush-blocks, but, with the notable exception of Nikau Cave and Adventure Waikato (the only commercial tourism operations), the average visitor would find little to warrant getting out of the car to see or do.

From a recreational perspective there are, therefore, currently few reasons for visitors to come to the area. The reasons are that travel distances are relatively long, many of the roads are gravel, and on arrival people will find that one of the potentially key and defining features of the area (the coastline) is unable to be reached. In these circumstances it is more likely that visitors from Auckland, Hamilton and elsewhere will choose instead to go to other parts of the country that are within a similar driving distance but which provide a greater range of recreational opportunity including access to rivers, lakes and coast.



### 3. REGIONAL CONTEXT

ROS (Recreational Opportunities Spectrum) maps of the wind farm area and greater Waikato Region have been supplied by the Department of Conservation Waikato Conservancy. These are shown in Figures 1 & 2.

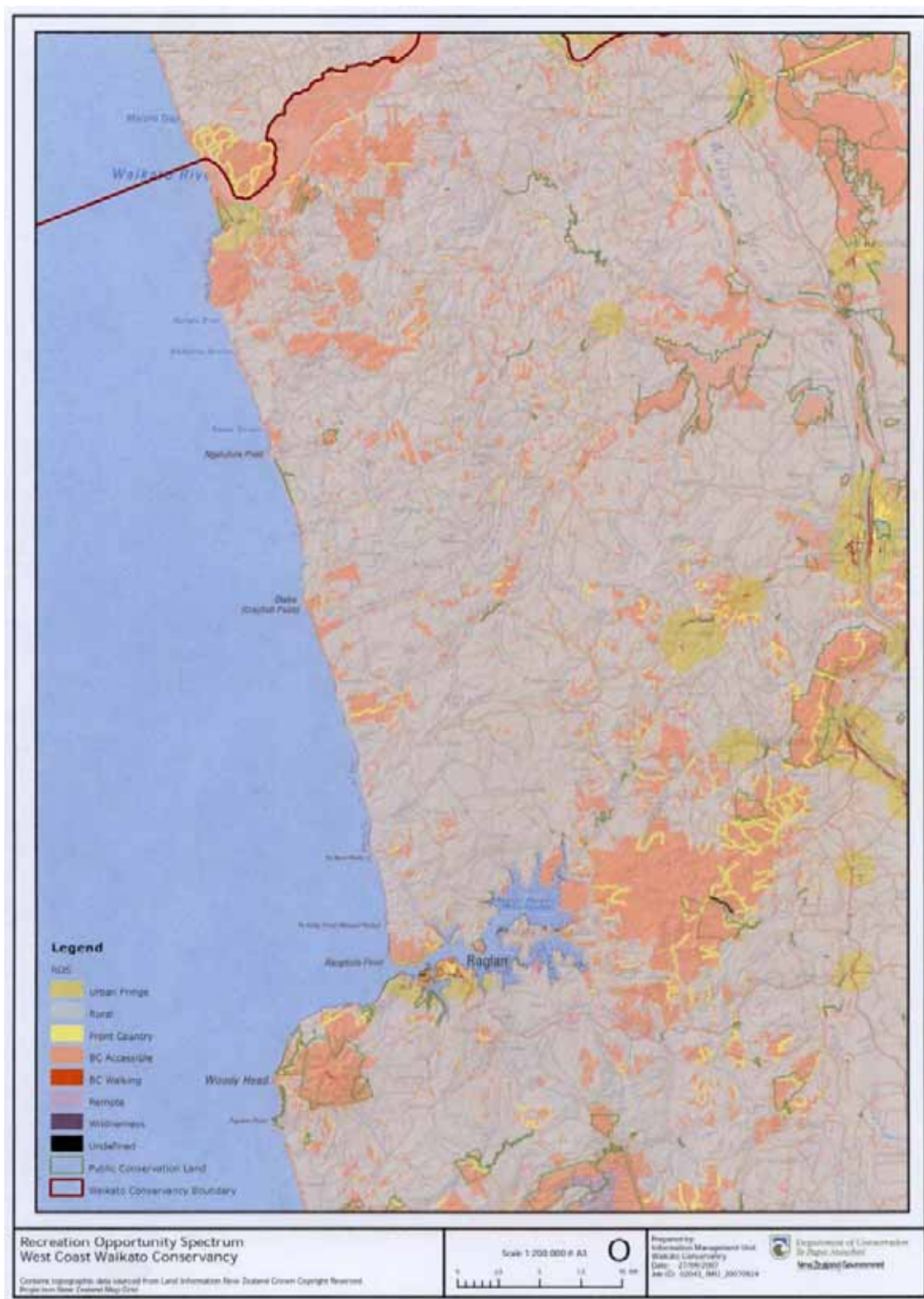
The ROS mapping system is a method for providing an inventory and wide-area overview of recreational environments and is used by agencies, such as the Department of Conservation, for recreational planning. The system classifies and groups areas according to the kind of outdoor recreational experience that visitors would expect to encounter. This is mainly a function of the naturalness of the environment and level of accessibility.

The principle behind the ROS system is that there should, ideally, be a wide and diverse 'spectrum' of recreational environments and opportunities within a defined region.

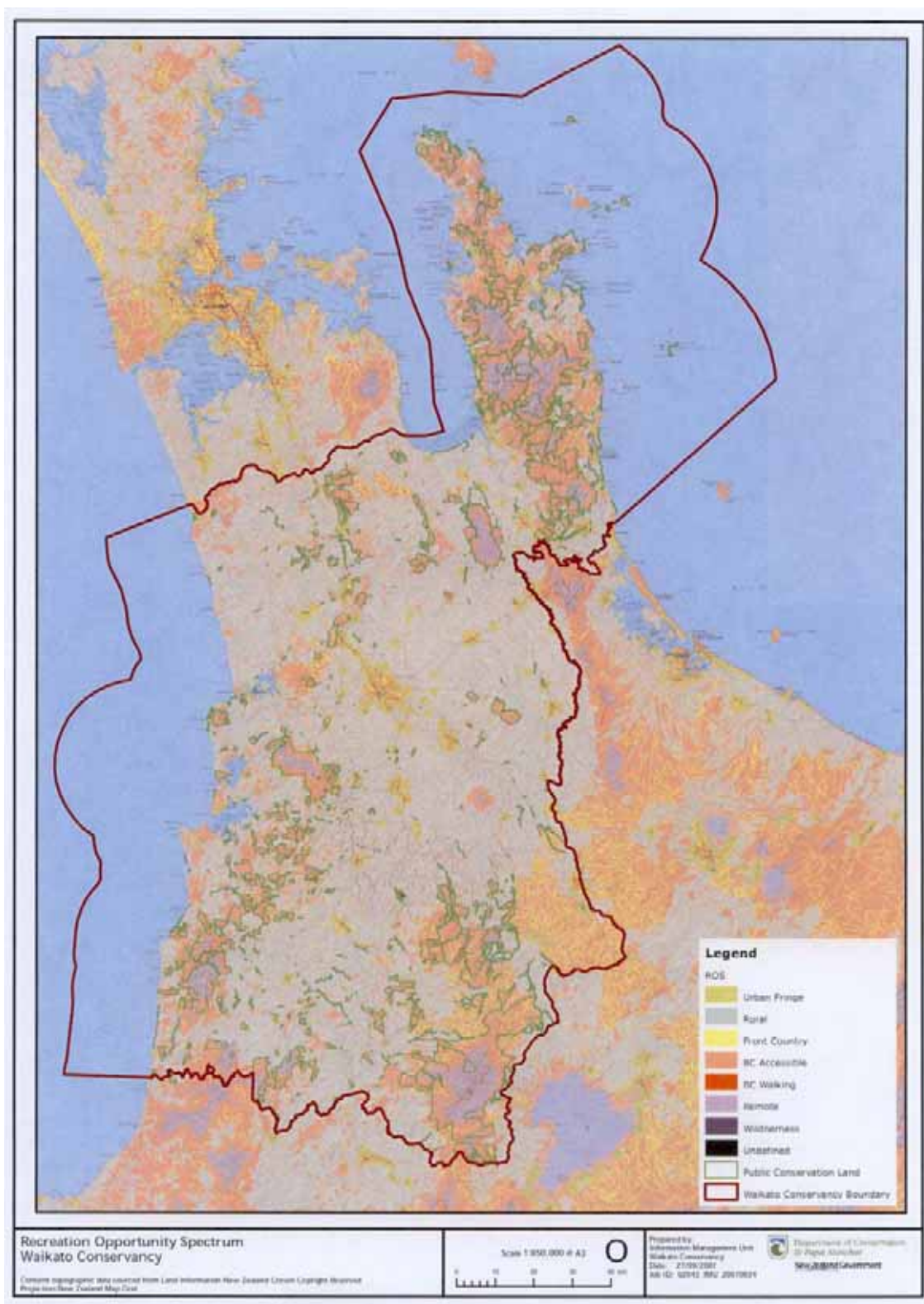
In the case of the wind farm study area we note that the majority of the land is classified as providing a 'Rural' recreational environment, with pockets of 'Back-Country Accessible'. These classifications are respectively the most common and second most common and widespread classifications in the Waikato Conservancy. They are not rare and, for that reason, not highly significant.

The only areas of possible interest would be the larger blocks of land classified as 'Back-Country Accessible' that are scattered down the coastal edge. This includes the north end of Waikorea Bay – although the significance of these areas is more a function of their coastal aspect than their ROS classification *per se*. All coastal space is recreationally valuable. It is just that coastline with a 'Back Country' character is more significant than the more common 'Rural' type.





**Figure 1** : Recreational Opportunities Spectrum (ROS) Map Showing Wind Farm Study Area  
(Source : Dept of Conservation, Waikato)

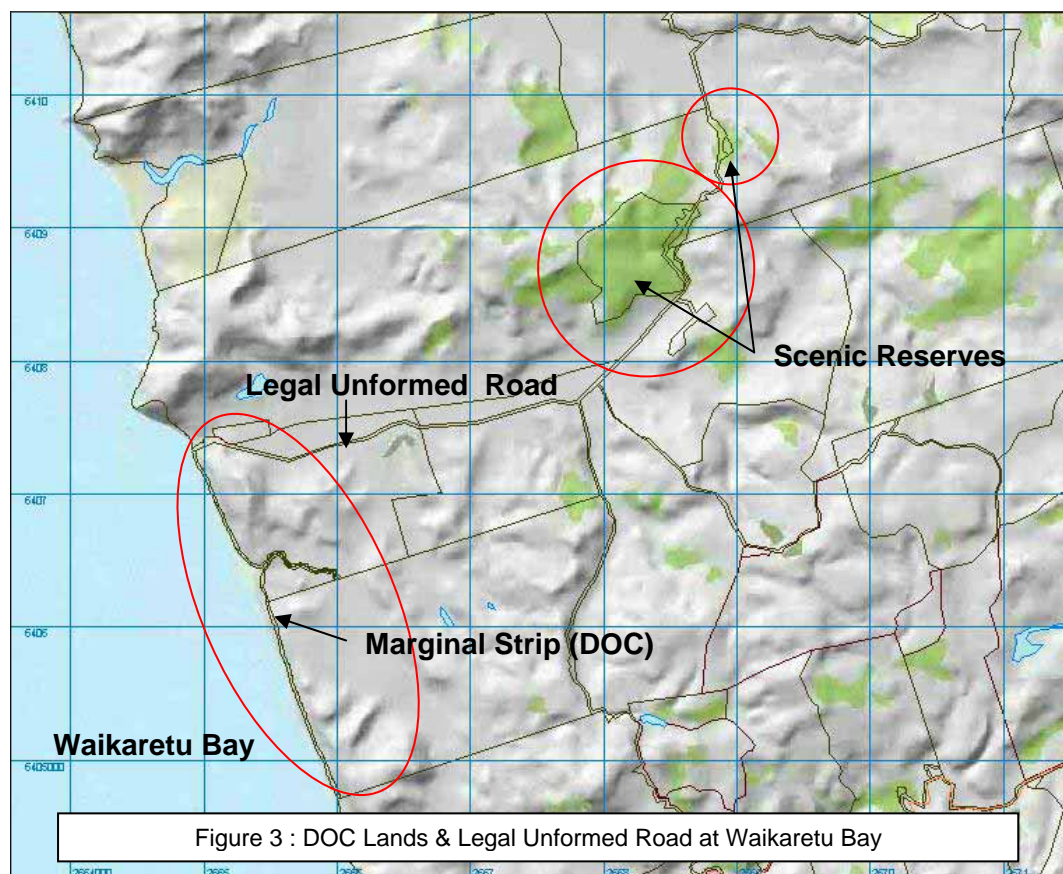


**Figure 2** : Recreational Opportunities Spectrum (ROS) Map for Waikato Conservancy  
(Source : Dept of Conservation, Waikato)

## 4. PUBLIC LAND & PUBLIC ACCESS

A recurring theme in this study is the lack of off-road public access and lack of public open space. This more than anything else defines and constrains the recreational potential of the area. Without public access, especially access to the coast, there is currently little for visitors to do in the area in the way of non-commercial recreational activities, other than drive right through.

In this section of the report we look more closely at precisely what public open space, or public access, currently exists.



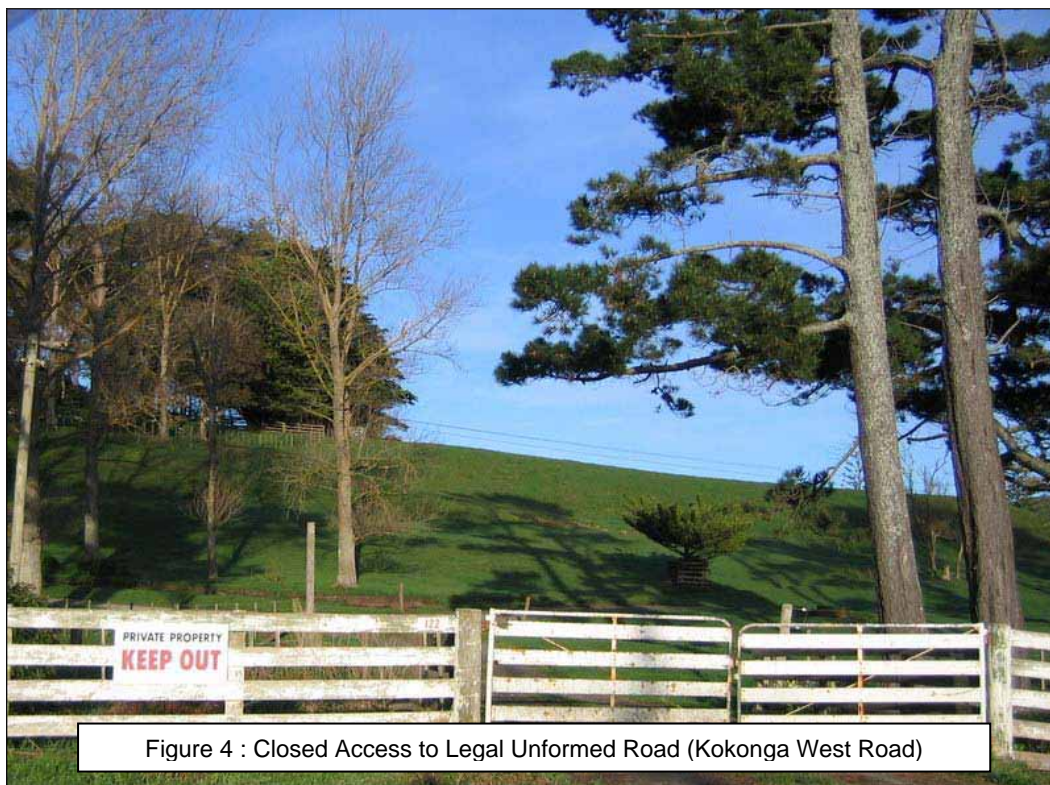
The only conventional public reserves in the area are the two small Department of Conservation (DOC) road-side scenic reserves on the Port Waikato to Waikaretu Road. These are Te Karaka Memorial Scenic Reserve (55 hectare) and Eric Baker Scenic Reserve (0.5 hectare). The Eric Baker Reserve has a road-side picnic table. Neither reserve has any form of walking track.

There are also two very small (0.1 – 0.3 ha) esplanade reserves beside the road on the Waikaretu Stream. Neither are sign-posted but there is a short (5 min) walk with swing-bridge access that has been developed (evidently by the private landowner) and is available for public use nearby.

DOC have a marginal strip along the last 750 metres of the Waikaretu Stream. The strip continues along the coast for about 1km to the north and 1.8km to the south of the Waikaretu mouth. There is, furthermore, a legal but unformed road (an extension of

Kokonga West Road) running down to Waikaretu Beach. The distance from the end of the formed road to the beach is about 1.6 kilometres.

Public access is theoretically possible along this unformed road but currently obstructed by a gate and large 'Private Property – Keep Out' sign erected at the end of the formed road. Therefore, although it is technically possible to walk the remaining 1.6 km to the beach from the road end, along the continuation of the legal road, few people are likely to be prepared to do so in consideration of the effort involved – including potential for a run-in with the landowner. The District Council are not currently planning to action the development of a formed road along this route in the foreseeable future.

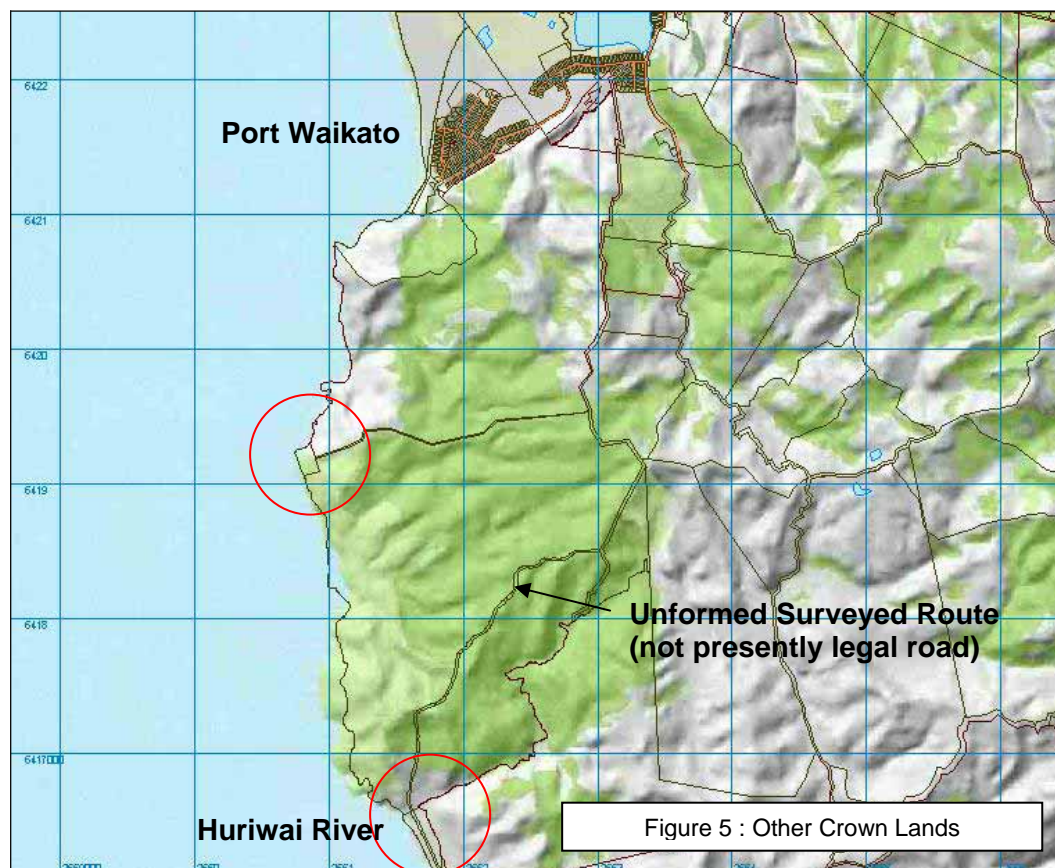


There is another small (2 ha) piece of Crown Land located on the coast about 2.3 kilometres south of Port Waikato. Refer to Figure 5. The precise status of this land is unknown (it is not recorded as part of the DOC estate) but its size and location suggest that it might have originally been for the purpose of a lighthouse on the southern approach to the Waikato Heads. There is a surveyed access route leading to the property but this is now in private hands. There is, therefore, no legal overland public access to this small parcel of Crown Land.

Further south, about 5 kilometres from Port Waikato, is another piece of Crown Land on the beach at the mouth of the Huriwai River (also shown in Figure 5). The total area is about 5 hectares. Again, the status of the land is unclear (it is not DOC land) but appears to have some relationship to the Crown Land section to the north and may have originally been intended as a boat landing site.

This land parcel, like the one to the north, has a surveyed access route leading to it. The access is once again not a legal road but in this case at least appears to be still in Council ownership. If so then, theoretically, the Franklin District Council could seek to have the route re-designated and developed as a road – although in practice this is unlikely to be a

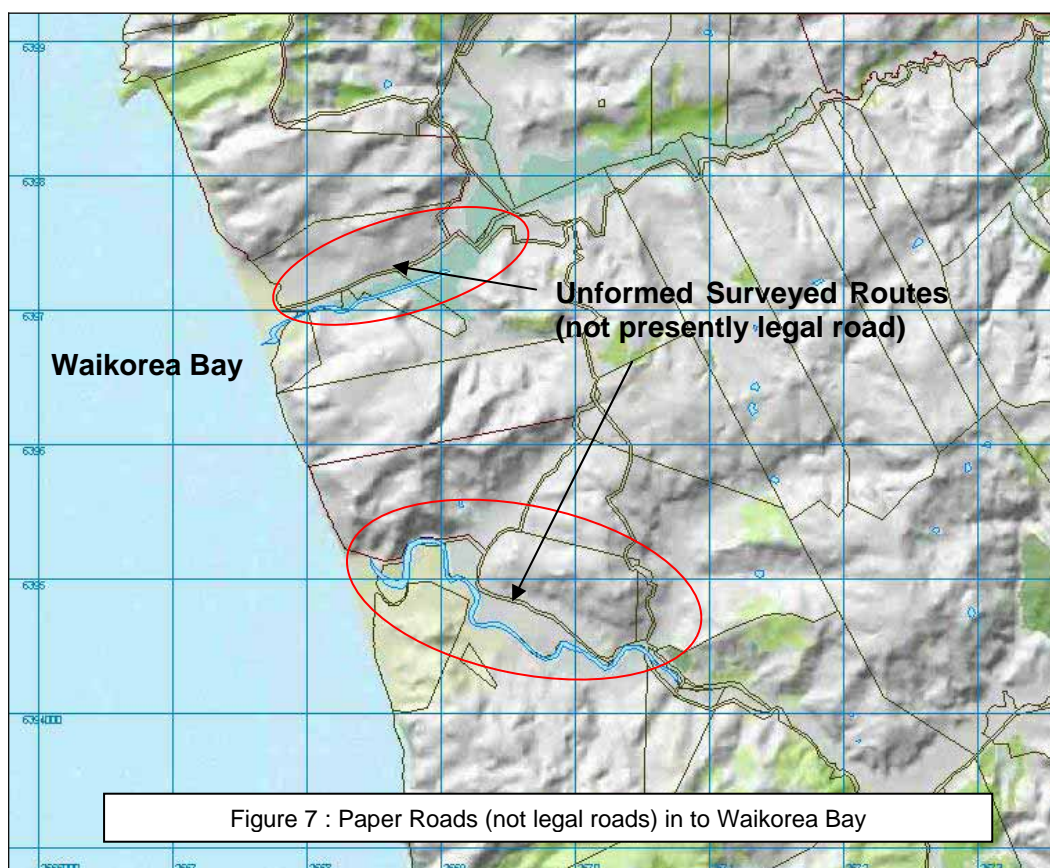
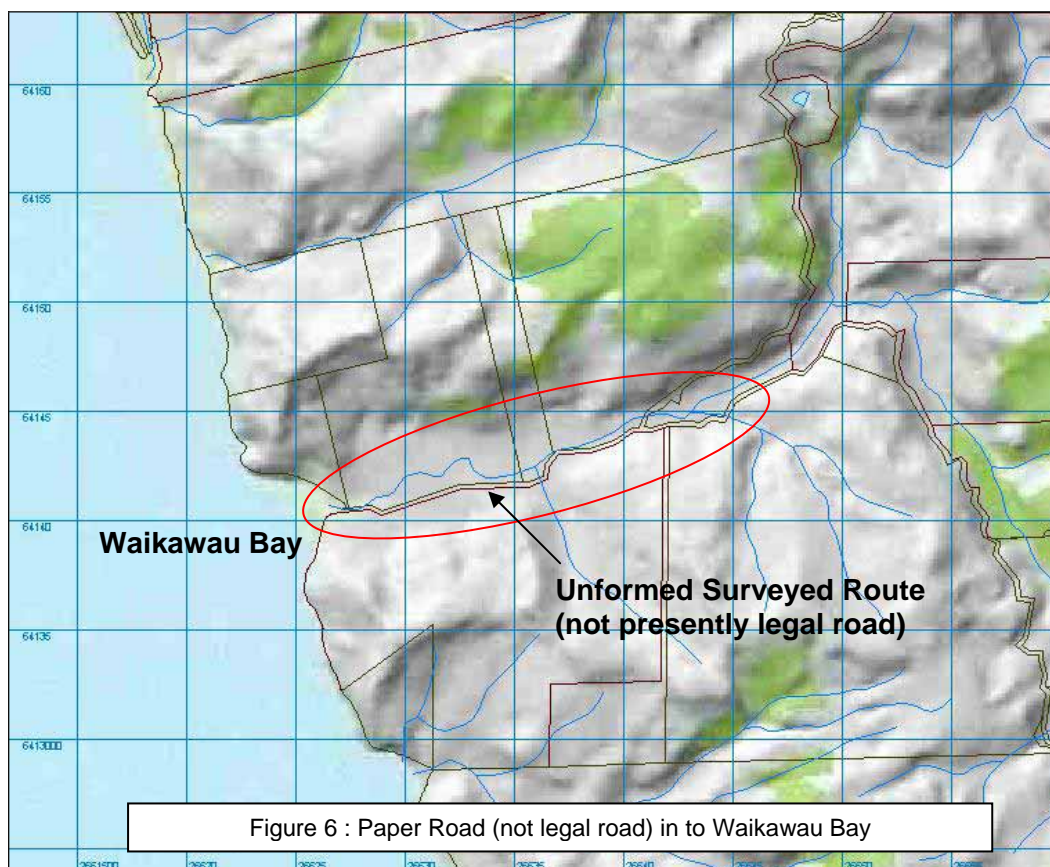
high Council priority. The surveyed route down to the Huriwai river mouth is, altogether, about 7 kilometres in length (being an extension of Stack Road and starting from Port Waikato) and passes over reasonably difficult ground.



There are similar surveyed routes in to Waikawau Bay and Waikorea Bay (Figures 6 & 7). Leading in to Waikawau Bay is a 1.4 km surveyed route off the Port Waikato to Waikaretu Road. This follows the Waikawau Stream down to the beach. At Waikorea Bay there are two surveyed routes (one beside the Waikorea Stream, the other beside the Waimai Stream). These are 2km and 2.6km long respectively and run down to the beach off Te Akau Coast Road.

None of these are legal roads but the surveyed strips are at least Council-owned (insofar as they have not been amalgamated in to adjacent properties). In this case they are owned by the Waikato District Council. The Council could potentially seek to designate and develop roads along these alignments.

The District Council have previously looked in to the establishment of road access to Waikorea Bay and in recent years have been in discussions with the landowner to see if a route can be developed. However, the issue for the Council is that the surveyed route does not correspond with the most practical route for the construction of a road. The Council have therefore sought to negotiate an alternative alignment although, to date, nothing has been agreed.



## 5. EXISTING PUBLIC RECREATION ACTIVITIES

The lack of existing off-road public access means that there is very little opportunity for non-commercial outdoor public recreation in the area at the present time. The only existing public recreation activities that have been identified are whitebaiting and the annual 'Rally New Zealand' event.

The whitebaiting season runs from mid-August to the end of November. At the opening of the season there are estimated to be about 15 – 20 whitebaiters actively fishing in the area. Numbers fluctuate through the season and through the days of the week, the tides and the weather. In most cases this activity is still dependant on either formal or informal access over private land. Whitebaiters generally have to pass over private property in order to get to the streams.

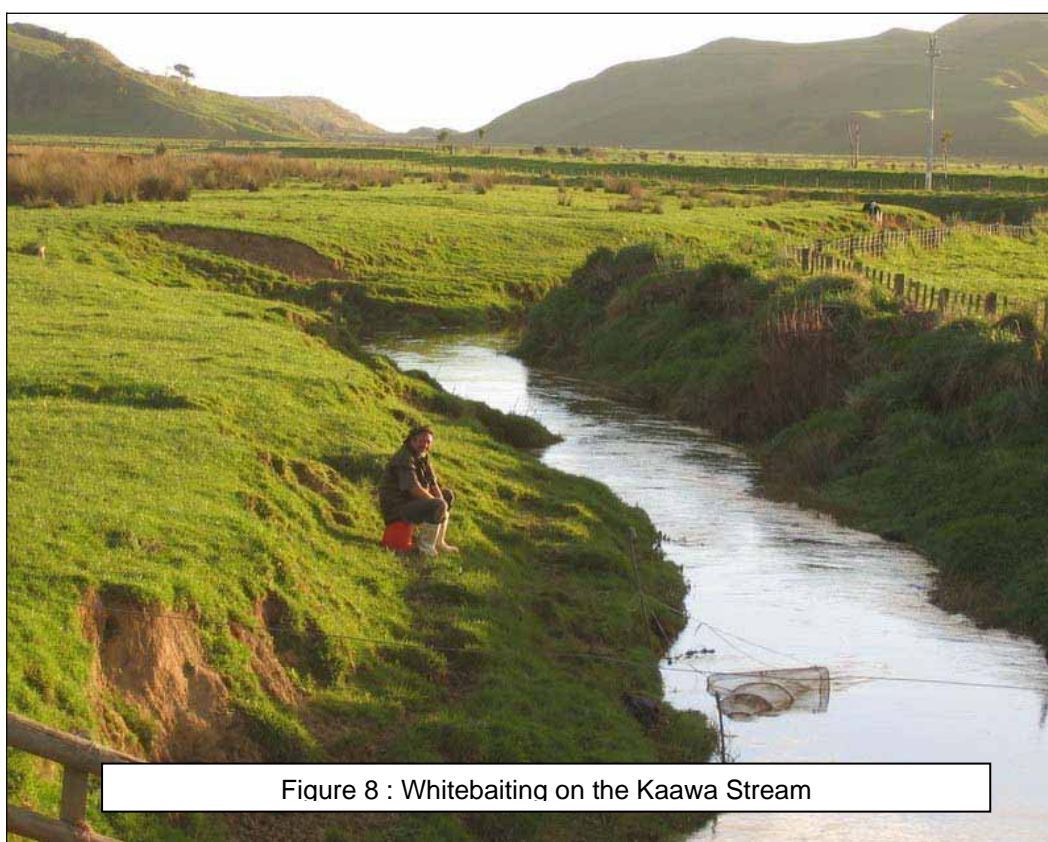


Figure 8 : Whitebaiting on the Kaawa Stream

The 'Rally New Zealand' event is part of the world rally circuit. This is based at Mystery Creek in Hamilton and runs for a period of 3 days in September. Of the 3 days, one day is spent in the Port Waikato – Te Akau area. It is an important event for the District and contributor to the local economy. The rally presently comes to New Zealand on an annual basis but, according to Rally New Zealand, will switch to a biannual event as of 2008 / 2009. The World Rally Circuit organisers are proposing to increase the number of countries on the circuit to twenty-four but to visit only 12 countries in any given year.

The circuit on the day that it comes to the Port Waikato – Te Akau area includes the Port Waikato to Waikaretu Road, Waikaretu Valley Road, Matira Road, Waimai Valley Road, Te Akau Road and Te Akau Coast Road. Because this is an on-road event it is not dependent on public access over private land.

Access to swimming, fishing, surfing or walking along the coast is practically non-existent, except where landowner consent is granted, or if anyone is prepared to exercise and contest a right of access down the unformed and unmarked extension of Kokonga West Road. The 1.6 km to the beach could theoretically be travelled on foot.

## 6. EXISTING TOURISM ACTIVITY

The two existing tourism operations in the area are Nikau Cave and Adventure Waikato.

The landowners and operators of Nikau Cave (Anne & Phillip Woodward) run tours through the cave and also offer farm-stay accommodation on site. There are about 1,500 visitors to the cave per year. The Woodwards are also in the process of building a café on Waikaretu Valley Road, not far from their home, and plan to develop this in conjunction with the caving business. The café will be a stop-off point for visitors travelling through the area, will help to showcase the caving operation, and will provide an alternative place of activity for non-cavers.

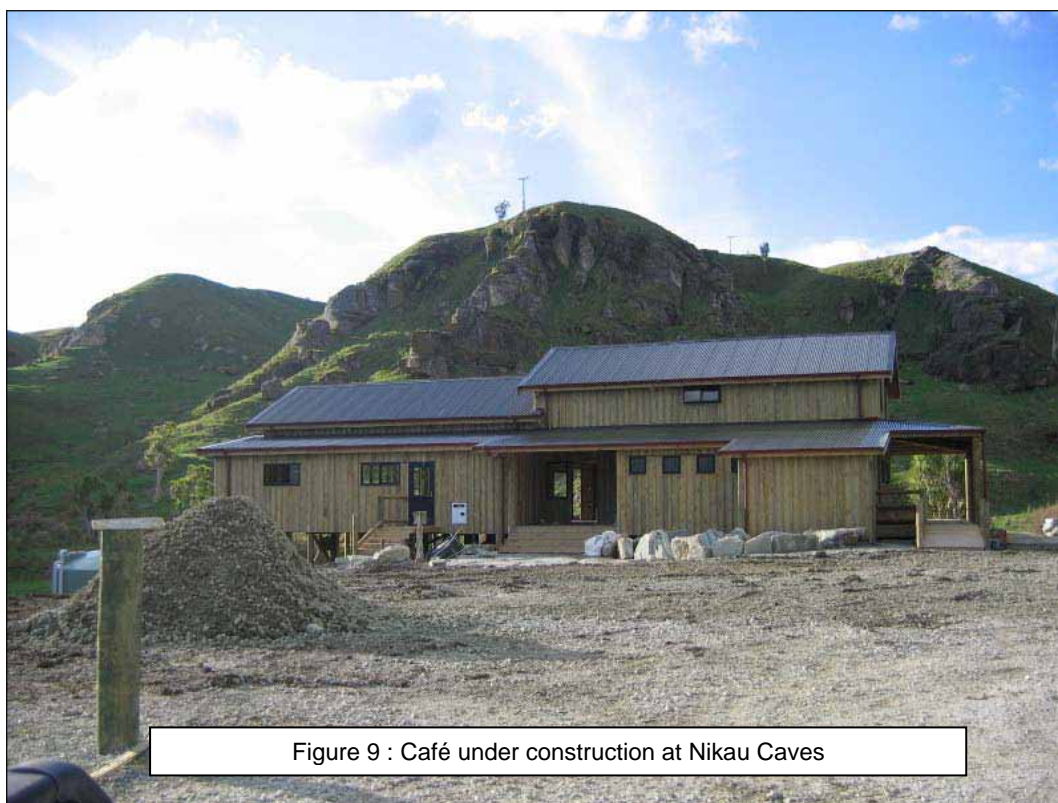


Figure 9 : Café under construction at Nikau Caves

The Woodwards have an interest in the project insofar as it is proposed to erect two wind turbines on their property. This should be acknowledged. They have nevertheless indicated that they do not see any likely conflict between the wind farm and the running of their tourism operation. They feel that the wind farm may in fact provide new opportunities in terms of the range of tours that they can offer. There are often people who are part of larger groups of visitors who are not interested in caving but may want to do alternative tours such as a visit to the wind turbines. The Woodwards plan to make these tours available.

The other tourism business – Adventure Waikato – is situated on Matira Road. A wide range of adventure tourism and team building activities are offered including caving,

abseiling, climbing and various other types of group adventure. The business caters to families, schools, individuals and corporate groups – mostly from Auckland and Hamilton. There is accommodation on site for up to 26 guests.

Adventure Waikato is owned and operated Simon and Rosie Worsp. They established the company and have been running it for about 12 years (although they are now at a stage of life where they are looking to sell the business and move on).

Simon Worsp says that he is concerned, but unsure, of the effect that the wind farm project would be likely to have on the area. His concerns are with the aesthetics of the turbines and the effects of construction activity associated with the development. He does not believe that it will promote tourism in the area generally, nor have any positive benefit for his own business specifically, but, at the time of interview, was waiting to see the final proposal and full set of information for the wind farm before deciding what to make of the project overall.

His principal concern appears to be with the potential effects of the increased number of trucks on local roads during the 5 year construction period and the routes that these vehicles will take. It would not suit Adventure Waikato to have a lot of heavy trucks using Matira Road or other roads used by people trying to get to their Matira Road property.



## 7. EFFECTS OF WIND FARM ON RECREATION & TOURISM

### 7.1 EFFECTS ON PUBLIC RECREATION

In the absence of any significant amount of non-commercial / free-access recreational activity in the area at present (mainly due to access constraints) it appears unlikely that the proposed wind farm will have any significant adverse effect on public recreation. There is little actually happening in the area, as far as public recreation is concerned, for the wind farm to affect.

The one potential effect would be on the Rally of New Zealand, for the one day per year (soon to be biannually) that the rally is in the area, insofar as roading improvements associated with the project will make the roads easier to drive. Better roads will be welcomed by local residents, and by visitors driving through, but may not be quite as ideal for rally enthusiasts. The relevant roads will still be shingle, but will be wider, and with easing of some bends.

Discussions with Rally New Zealand<sup>1</sup> suggest, however, that this should not be a significant problem. On detailed inspection it appears that curves affected by realignment will be relatively few<sup>2</sup>. There will still be an adequate amount of challenge to the road. Rally New Zealand also appreciate that these are public roads and that, over time, on-going roading improvements (with or without the wind farm) are therefore likely to occur.

The greater concern for Rally New Zealand was that there should be coordination between the wind farm project and Rally New Zealand so that, for example, the road is sure to be free of road-works and that the roads are in a reasonable state for driving on at the time of the Rally. Assurances to this effect have been given on behalf of the Hauāuru mā raki-Waikato Wind Farm project. It will not be difficult to ensure that road works are programmed around the timing of the Rally and to make sure that construction vehicles are cleared from the road ahead of both the reconnaissance runs and main event.

Whitebaiters are unlikely to be significantly affected. The wind farm will not have any impact on the whitebait fishery as long as site run-off is adequately managed. And because whitebaiters are already generally fishing in modified (rural pastoral) settings it is unlikely that they would perceive the turbines as significantly impacting on any kind of natural experience. Whitebaiters typically fish only a short distance from the road and from their car. In general they do not actively seek out the more remote and scenic areas for whitebaiting unless these areas are also where the best fishing happens to be. Certainly, some whitebaiters will like the turbines and others will not, but the overall effect of the presence of the turbines on the experience of whitebait fishing will be minor.

<sup>1</sup> Meeting between Al Yates (Waikato Wind Farms) & Williard Martin (Rally NZ) 26/10/2007.

<sup>2</sup> Details of proposed roading improvements are outlined in the Transportation Assessment for the Wind Farm project (Traffic Design Group, 2008).



## **7.2 EFFECTS ON TOURISM ACTIVITY**

### **Nikau Cave**

The owners and operators of Nikau Cave are participants in the project and therefore stand to benefit from it anyway. They have however indicated that they do not see any likely conflict between the existence of the wind turbines and the running of their tours. Rather, in their opinion, the turbines could provide opportunity for a widening of tourist interests in the area. If the wind farm project proceeds the Woodward's will look in to expanding the range of tour options on offer including tours among the turbines.

This would not be without precedent. Similar tours are on offer at the Tararua Wind Farm. Quad bike and horse trek tours are available there by appointment. The tour companies are not exclusively windfarm-focused but make use of the Tararua wind farm as one of several tour options available. Overseas examples of commercial wind farm tours include tours of the Woolnorth wind farm in Tasmania, the Codrington wind farm in Victoria (where tours have been running since the wind farm opened in 2001), and Palm Springs, California.

For Nikau Cave, therefore, the wind farm is not seen as being likely to have any significant adverse effect and may in fact compliment their existing business.

### **Adventure Waikato**

The owners of Adventure Waikato are as yet unsure about what effect the wind farm will have on them but have so far identified effects on local aesthetics and, in particular, effects of construction traffic as being of potential concern.

In terms of aesthetics it is true that people, including visitors to the property, will be aware of the presence of the wind turbines and will be able to see some of turbines, or parts of them, from various places on site. The nearest turbine will be about 1.6 km distant from the property boundary. There will also be a general awareness among visitors to the area (including visitors to Adventure Waikato) of the wider extent of the wind farm beyond the immediate view.

Perceptions are likely to differ. Some people will like to turbines – others will not. Those who like them will see them as a feature of interest in the landscape (hence the plan by the operators of Nikau Cave to offer tours) whereas those who do not like them will see them as a human imposition on the landscape. But for others, and probably for the majority of people, in the context of an already modified rural pastoral landscape, individual reaction to the turbines is likely to be mixed (that is, neither strongly liking or disliking).

People will notice the wind farm and be aware of it, and will form an opinion on it, but are unlikely to be affected by this perception to the extent that it significantly interferes with their experience of activities at the Adventure Waikato site.

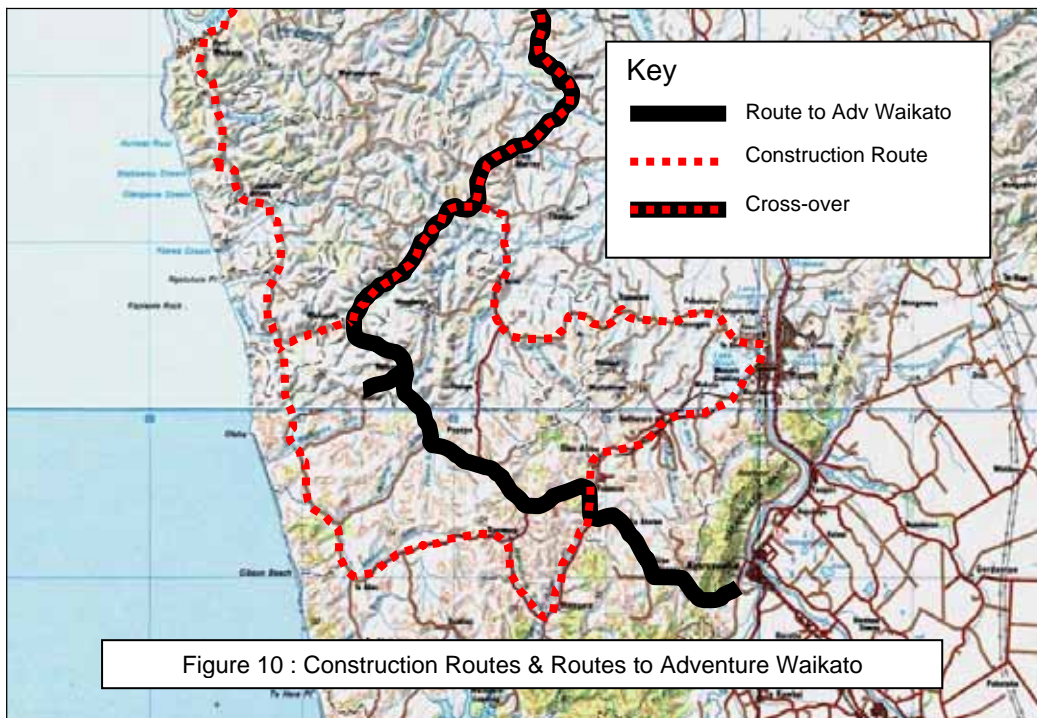
With regard to the possible effects of construction traffic the main concern is that visitors to Adventure Waikato will be deterred from visiting by heavy construction vehicles (carrying aggregate etc) on roads leading to and from the site and/or passing by the site on Matira Road.



A review of the Traffic Design Group Transportation Assessment<sup>3</sup> for the wind farm suggests, however, that this should not be a problem. The main construction routes as shown in the draft Traffic Assessment are via either Huntly or Pokeno. The routes to Adventure Waikato, out of Auckland and Hamilton, are via Mercer and Ngaruawahia respectively. This means that there will be relatively little cross-over except for a small amount of construction and Adventure Waikato visitor traffic sharing part of Waikaretu Valley Road (a sealed road) and State Highway 22 (also sealed).

The other roads leading to Adventure Waikato (Richardson, Waimai Valley, Waingaro, Dixon and Matira Road) are not on the main construction circuit and neither route, from Auckland or Hamilton, passes through any of the proposed controlled construction zones. The proposed construction zones will affect roads nearer to the coast.

Figure 10, below, shows where the main construction traffic routes will be. Also shown are the main access routes to Adventure Waikato. Further details will be found in the Transportation Assessment report.



<sup>3</sup> Traffic Design Group (2008) *Contact Wind Limited: Hauauru ma raki Waikato Wind Farm Transportation Assessment*.

## **Pukerewa Marae**

A third party potentially interested in the tourism potential of the wind farm are the people at Pukerewa Marae. At this stage there has only been informal internal discussion but ideas have been floated around the development of some form of tourism (such as over-night stays) based on the Marae if it is found that the wind farm development brings visitors in to the area. A decision on whether or not to establish some kind of tourism and/or accommodation venture will probably be held off until it is seen how visitor numbers change as a result of the construction of the wind farm.



Figure 11 : Pukerewa Marae

## 8. MITIGATION & ENHANCEMENT OPTIONS

The assessment above indicates that, providing there is (as agreed) on-going communication and coordination with Rally New Zealand, the proposed Hauāuru mā raki-Waikato Wind Farm will not have a significant adverse effect on either existing or future recreation and tourism in the area.

From this finding it is concluded that, in terms of the RMA duty to ‘avoid, remedy or mitigate’ adverse effects on the environment (in this case specifically in relation to recreation and tourism), no additional mitigation is required.

Nevertheless, while mitigation measures will not be strictly necessary, this does not preclude the possibility of voluntary recreational enhancement initiatives (in consideration of Contact Wind’s longer term presence in the area) being actioned through the project. As part of the brief for this study we have been asked to consider these options as well and briefly report on their possible viability. The remainder of this section of the report discusses a few such options. Note that these should be seen as optional enhancement measures only.

### 8.1 COASTAL ACCESS



Lack of public access is the greatest existing constraint on recreational opportunity in the wind farm study area. This applies in particular to coastal access. There are currently no formed legal roads to any of the 35 kilometres of coast.

If coastal access could be provided as a result of the wind farm development then this would have a significant beneficial effect on public recreational opportunity in the area – although care would be needed in the way that any such access was designed. In particular

it is recommended that access to any of the beaches in this area, if developed, should be pedestrian-only (no 4-wheel drive, quads or off-road bikes).

A pedestrian-only beach would provide a point of difference with Raglan and Port Waikato and therefore maintain a distinctly different beach experience (with respect to ROS principles). Pedestrian-only access would also help to avoid or reduce some of the problems associated with off-road vehicles, as at Port Waikato, where there has been on-going damage to sand dunes and nesting habitat for NZ dotterel and other species of shore bird.

Note that even with non-motorised access there are still risks relating to possible effects on resident native plants and animals. Kessels & Associates (2008) point out that all beaches and coastal cliffs within the study area can potentially provide habitat for sensitive and rare plants and animals such as the critically endangered *Hebe speciosa* and NZ dotterel<sup>4</sup>. A site-specific risk assessment, and consultation with the Department of Conservation, would be advised before proceeding with the development of access to any given beach. The Department of Conservation may in fact conclude, on balance of recreational versus ecological issues, that they do not wish to see any further coastal access developed at all.

It is understood that there have been project-level discussions with one of the landowners in the southern part of the wind farm area and that, if required, a pedestrian coastal access could potentially be arranged.

## 8.2 VIEWING PLATFORMS

For the benefit of visitors it would be useful to erect one or more elevated viewing platforms as part of the wind farm development so that people are able to get a better outlook on the turbines and wider landscape. A platform provides a point of interest that visitors will naturally gravitate to and where they will be able to find information on the wind farm.

## 8.3 COASTAL WALKING TRACK

There may be opportunity for the development of a coastal walking track with linkage between the various turbine clusters along the coast and joining across private land.

This would heavily depend upon private landowner interest and support but could potentially be workable – most likely if developed as a private walkway on the model of the Banks Peninsula walk. The Banks Peninsula walkway is run as a private enterprise, across a series of farms, with self-contained overnight accommodation provided along the way. It is a 4-day walk for which the charge is \$225 per person. This would provide an income to the relevant landowners and enable the track and huts to be maintained.

Realistically, the chances of a sufficient ‘buy-in’ from all necessary landowners is likely to be quite low. But it remains an option that could potentially be pursued (subject to landowner interest) in conjunction with, and facilitated by, the wind farm project.

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<sup>4</sup> Kessels & Associates (2008) *Contact Wind Ltd Hauauru Raki – Waikato Wind Farm: Assessment of Ecological Effects*.



## **8.4 MOUNTAIN-BIKING CIRCUIT**

Another option that has been considered is the establishment of some form of mountain-bike circuit in association with the wind farm development.

A network of unsealed construction roads will be built around each of the clusters of turbines. Once the construction period is over some of these roads could potentially be adapted as arterial routes for a mountain-biking circuit – although there would still be a significant amount of additional on-going work required to then develop and maintain the secondary, and technically more interesting, tracks. The turbine access roads, on their own, would not provide enough of a ‘circuit’. They will generally be dead-end branch tracks with minimal technical difficulty.

The development of a track network of this kind would again entirely depend upon landowner interest and support. The land is all privately owned. The owners would therefore have reason to expect that some kind of financial return for allowing access and to cover the costs of on-going maintenance of secondary tracks – if indeed they were sufficiently interested in doing anything at all.

Income could potentially be earned by charging for access or by providing overnight accommodation. At a distance of 1 to 1½ hours drive from Hamilton and Auckland, a mountain-bike park in this area (provided it is of an adequate standard) could bring in riders from either centre.

Overall, the success and long-term sustainability of a mountain-biking circuit (as with a walking track) would depend on the active support and interest of private landowners. For it to work the tracks would need to be maintained, and for maintenance to happen there would need to be a financial return, either through paid access, tours or accommodation associated with the tracks. It would also require there to be sufficient sustained interest, initiative, expertise and preparedness on the part of the landowners (who would look after the tracks in the long term) to take the necessary investment risk.

