Before the Board of Inquiry
Hauauru Ma Raki Wind Farm Proposal

Under	the Resource Management Act 1991
In the matter of	Resource consent applications by Contact Wind Limited relating to the Hauauru Ma Raki Wind Farm Proposal
And	
In the matter of	Notices of Requirement and a Resource Consent Application by Contact Energy Limited relating to the Hauauru Ma Raki Wind Farm Proposal

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Supplementary statement of evidence of ***John Edward Dowding***

Dated: 17 April 2009

Date of hearing: Commencing 27 April 2009

Director-General of Conservation

18 – 32 Manners Street Tel +64 4 471 0726
P O Box 10-420 Fax +64 4 471 3170
Wellington 6143

Solicitors acting: Shona Bradley/Jeremy Prebble/Alice Hunt

S1 My full name is John Edward Dowding. I refer the Board of Inquiry to the statement of my qualifications and experience in my evidence in chief. I reaffirm my commitment to comply with the code of conduct for expert witnesses in the Environment Court.

S2 The purpose of this supplementary evidence is to provide further information on the potential population-level consequences to shorebirds of an additional set of predicted collision rates calculated by Dr Percival and presented in his supplementary statement of evidence.

S3 In his evidence in chief, Dr Percival has presented the results of collision-risk modelling for a range of migratory shorebird species potentially at risk from the proposed HMR wind farm. In that modelling, Dr Percival used avoidance rates of 95% for the northwards migration (which occurs mainly by day in the vicinity of the site) and 90% for the southward migration (which occurs mainly at night). I refer to this as the 95/90 scenario. Using the results of Dr Percival's modelling, I calculated predicted population trajectories for two species, namely pied oystercatcher and wrybill. Those population trajectories are shown in Tables 1 and 2 of my evidence in chief.

S4 In his supplementary evidence, Dr Percival has noted that he still believes the 95/90 scenario is an appropriate precautionary approach in this case. However, in response to rebuttal evidence from Mr Kessels and Dr Seaton he has provided the results of additional modelling of collision risk for the same species, using an avoidance rate of 95% for both northwards and southwards migrations. I refer to this as the 95/95 scenario. I have re-calculated the predicted impacts at the population level for pied oystercatcher and wrybill using the additional collision estimates.

Pied oystercatcher

S5 The 95/95 scenario predicts a mean number of 135 pied oystercatcher collisions annually, with lower and upper 95% confidence limits of 39 and 251 collisions respectively. Using the same demographic data and procedures as in my evidence in chief, I have calculated decline rates for the pied oystercatcher population in the absence of the proposed wind farm (the *Baseline* scenario),

assuming 135 casualties annually (the *MeanA* scenario), and assuming 39 and 251 casualties annually (the *L95A* and *U95A* scenarios respectively).

S6 The resulting population trends are shown in Figure S1. As shown in Figure S1, the *Baseline* scenario predicts that the pied oystercatcher population will decline by about 4% in the next 50 years. With the predicted additional mortality from the proposed wind farm, this will rise to about 6-15% (the range between the *L95A* and *U95A* scenarios), with an average decline of about 10% under the *MeanA* scenario. Thus under the 95/95 scenario, which is less precautionary than the 95/90 scenario, the population modelling predicts that the decline rate in the presence of the wind farm would be about 2.5 times greater than without it. In absolute terms, the *MeanA* scenario suggests that there would be about 7,300 less pied oystercatchers in the population in 50 years in the presence of the wind farm than without it.

Wrybill

S7 I have undertaken a similar analysis for wrybills, using the 95/95 scenario predictions of an annual mean of 7.7 collisions and lower and upper 95% confidence limits of 2.2 and 14.3 collisions respectively. The results are shown in Figure S2. The *Baseline* scenario predicts the wrybill population will decline by about 20% in the next 50 years. With the predicted additional mortality from the proposed wind farm under the 95/95 scenario, this rises to 25-36% (the range between *L95A* and *U95A*), with an average decline of 30% under the *MeanA* scenario. In absolute terms, the *MeanA* scenario suggests that there would be about 500 less wrybills in the population in 50 years in the presence of the proposed wind farm than without it. Even with the less-precautionary approach represented by the 95/95 scenario, this still indicates a substantial increase in decline rate. Given the Threatened status of the wrybill and the relatively small size of the population, it is my view that this result is still one of particular concern.

CONCLUSIONS

S8 In my evidence in chief, I concluded that the information currently available suggested that the proposed wind farm would have substantial negative effects on pied oystercatchers and wrybills at the population level. The additional

modelling presented here does not cause me to change that conclusion. The 95/95 scenario is not as precautionary as the 95/90 scenario, but still results in predictions of substantial adverse effects on those species.

S9 Even adopting this less precautionary approach, it is still by no means clear that the potential effects of the proposed HMR wind farm on migratory shorebirds can in practice be avoided, remedied or mitigated.

John Edward DOWDING
17 April 2009

Figure S1 Population projections for pied oystercatcher (95/95 scenario)

PIED OYSTERCATCHER SCENARIOS & INPUT DATA							
All assume 16% turbine downtime, 95% avoidance northwards, 95% avoidance southwards							
Risk corridor width 6000 m							
Summary		**age**	**max**	**1st yr**	**2nd yr**	**adult**	**extra birds**
	prod/pair	**1st br**	**age**	**surv/mort**	**surv/mort**	**surv/mort**	**killed by WF**
Basic	0.64	4	30	0.550/0.450	0.800/0.200	0.892/0.108	0
L95A	0.64	4	30	0.54983/0.45017	0.800/0.200	0.891645/0.108355	39
MeanA	0.64	4	30	0.54941/0.45059	0.800/0.200	0.89077/0.10923	135
U95A	0.64	4	30	0.54891/0.45109	0.800/0.200	0.88971/0.11029	251
	Total population 120 000, of which about 40 000 remain in SI, 80 000 migrate to NI						
	Of NI popn, about 10 000 are sub-adults & remain in NI harbours; do not migrate						
	Remaining 70 000 birds migrate along west coast						
Baseline	No WF, background mortality						
		Start no				*Ann deaths*	
	1st years	10000	of which 0.450 die annually =			4500	
	2nd years	5000	of which 0.200 die annually =			1000	16840
	Adults	105000	of which 0.108 die annually =			11340	
L95A	Lower 95%CL from Monte Carlo simulation						
	MC says WF kills 39 birds/yr (19.5 summer, 19.5 winter)						
		Start no				*Ann deaths*	
	1st years	10000	of which 0.45017 die annually =			4501.7	
	2nd years	5000	of which 0.200 die annually =			1000	16879
	Adults	105000	of which 0.108355 die annually =			11377.3	
MeanA	Mean from Monte Carlo simulation						
	MC model says WF kills 135 birds/yr (67.5 summer, 67.5 winter)						
		Start no				*Ann deaths*	
	1st years	10000	of which 0.45059 die annually =			4505.9	
	2nd years	5000	of which 0.200 die annually =			1000	16975
	Adults	105000	of which 0.10923 die annually =			11469.1	
U95A	Upper 95%CL from Monte Carlo simulation						
	MC says WF kills 251 birds/yr (125.5 summer, 125.5 winter)						
		Start no				*Ann deaths*	
	1st years	10000	of which 0.45109 die annually =			4510.9	
	2nd years	5000	of which 0.200 die annually =			1000	17091
	Adults	105000	of which 0.11029 die annually =			11580.1	
	Note adjustments for fact that 1st year birds only migrate N						
	Scenario			*Proportion of popn at risk*	*Raw number killed*	*Adj number killed*	
	L95A						
	1st years			0.087	3.4	1.7	
	2nd years			0.000	0	0	
	Adults			0.913	35.6	37.3	
	MeanA						
	1st years			0.087	11.7	5.9	
	2nd years			0.000	0	0	
	Adults			0.913	123.3	129.1	
	U95A						
	1st years			0.087	21.8	10.9	
	2nd years			0.000	0	0	
	Adults			0.913	229.2	240.1	

Population projections for PIED OYSTERCATCHER

Baseline		
r		-0.0008461
λ		0.99915426
L95A		
r		-0.00128
λ		0.99872082
MeanA		
r		-0.002150
λ		0.99785231
U95A		
r		-0.00321
λ		0.99679515

	Baseline	*L95A*	*MeanA*	*U95A*
λ	**0.999154**	**0.998721**	**0.997852**	**0.996795**
years				
0	120000	120000	120000	120000
10	118989	118474	117448	116209
20	117987	116967	114949	112538
30	116993	115479	112504	108983
40	116007	114011	110111	105540
50	115030	112561	107769	102206
% decline in 50 yrs	**4.1**	**6.2**	**10.2**	**14.8**

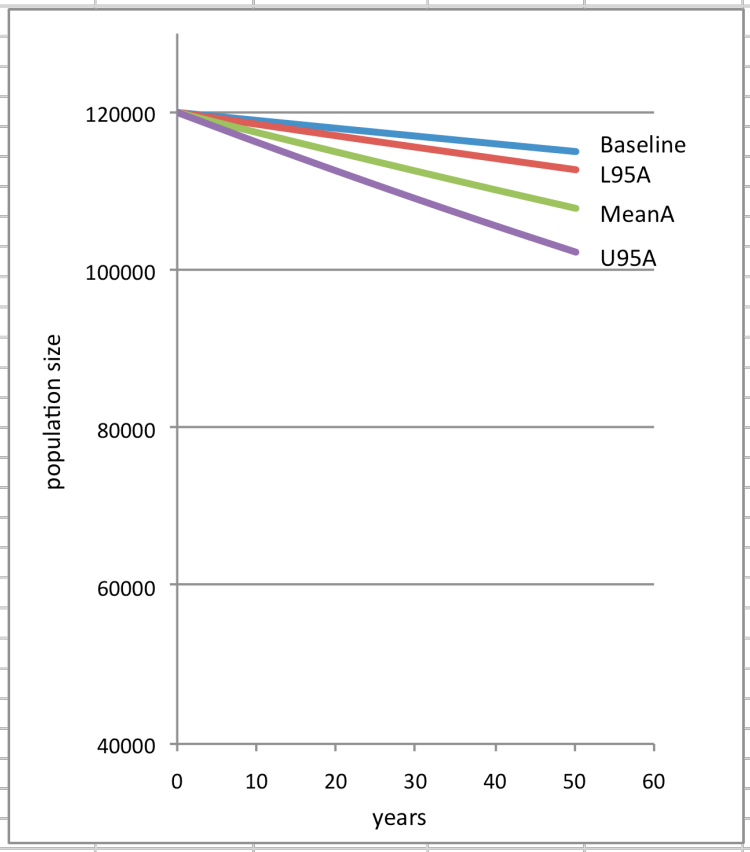

Figure S2 Population projections for wrybill (95/95 scenario)

WRYBILL SCENARIOS & INPUT DATA						
All assume 16% turbine downtime, 95% avoidance northwards, 95% avoidance southwards						
Risk corridor width 6000 m						
Summary		**age**		**1st yr**	**adult**	**extra birds**
	prod/pair	**1st br**	**max age**	**surv/mort**	**surv/mort**	**killed by WF**
Baseline	0.79	2	25	0.500/0.500	0.832/0.168	0
L95A	0.79	2	25	0.49956/0.50044	0.83156/0.16844	2.2
MeanA	0.79	2	25	0.49846/0.50154	0.83046/0.16954	7.7
U95A	0.79	2	25	0.49714/0.50286	0.82914/0.17086	14.3
	Total population 5000, of which 500 are 1st years, 4500 are adults					
	4500 birds (90% of population) migrate along west coast					
Baseline	No WF, background mortality					
		Start no			*Ann deaths*	
	1st years	500	of which 0.500 die annually =		250	1006
	Adults	4500	of which 0.168 die annually =		756	
L95A	Lower 95%CL from Monte Carlo simulation					
	MC model says WF kills 2.2 birds/yr; assume 0.22 are 1st years, 1.98 are adults					
		Start no			*Ann deaths*	
	1st years	500	of which 0.50044 die annually		250.22	1008.2
	Adults	4500	of which 0.16844 die annually		757.98	
MeanA	Mean from Monte Carlo simulation					
	MC model says WF kills 7.7 birds/yr; assume 0.77 are 1st years, 6.93 are adults					
		Start no			*Ann deaths*	
	1st years	500	of which 0.50154 die annually		250.77	1013.7
	Adults	4500	of which 0.16954 die annually		762.93	
U95A	Upper 95%CL from Monte Carlo simulation					
	MC model says WF kills 14.3 birds/yr; assume 1.43 are 1st years, 12.87 are adults					
		Start no			*Ann deaths*	
	1st years	500	of which 0.50286 die annually		251.43	1020.3
	Adults	4500	of which 0.17086 die annually		768.87	

Population projections for WRYBILL

Baseline			
r	-0.004453		
λ	0.9955569		
L95A			
r	-0.00571		
λ	0.99430627		
MeanA			
r	-0.00715		
λ	0.9928755		
U95A			
r	-0.0089		
λ	0.99113949		

	Baseline	*L95A*	*MeanA*	*U95A*
λ	**0.995557**	**0.994306**	**0.992876**	**0.991140**
years				
0	5000	5000	5000	5000
10	4782	4722	4655	4574
20	4574	4460	4334	4185
30	4375	4213	4035	3828
40	4184	3979	3756	3502
50	4002	3758	3497	3204
% decline in 50 yrs	**20.0**	**24.8**	**30.1**	**35.9**