

BEFORE THE Board of Inquiry

IN THE MATTER of the Resource Management Act 1991
("the Act")

AND

IN THE MATTER of resource consent applications by
Contact Wind Ltd in respect of the
Hauauru Ma Raki Wind Farm Proposal for
the construction of the wind farm (LO8052
– Land Use Consent) and for all
improvements to local roads (LO8056
Land Use Consent)

STATEMENT OF EVIDENCE OF ERNST JOHN VAN DER LEDEN

1. Qualifications and Experience

- (a) My full name is Ernst John Van Der Leden. I hold a BSc in Civil Engineering and a BSc in Forest Engineering from the Oregon State University.
- (b) I have 30 years work experience in forest engineering, computer programming, and management. I am a shareholder and director of Data Interface Technologies Limited ("DIT"), a New Zealand company which develops computer software and provides information technology services. DIT produces 3-Dimensional spatial modelling software called K2Vi (Key to Virtual Insight).
- (c) The last four years of my work experience has involved working on the preparation and presentation of 3-D computer models depicting proposed developments of various kinds using this K2Vi software.
- (d) I have presented evidence before the Environment Court, at Council Hearings, and at public and private consultations, in which K2Vi technology has been used.

2. Code of Conduct

- (a) I have read and agree to comply with the code of conduct for Expert Witnesses contained in the Practice Note on Alternative Dispute Resolution and Expert Witnesses issued by the Environment Court on 31 March 2005.

3. Instructions

- (a) I am giving this evidence on behalf of Sunset View Limited and Rimanu Farms Limited. The brief given to me was to produce a 3 Dimensional model of the proposed Hauauru Ma Raki Windfarm turbines. This model was to be produced using DIT's K2Vi software using the methodology described below. The model was to be used to portray the visual impact of the proposed development. The software allows interested parties to go to nominated Viewpoints in the model to view the proposed development and also to "fly" through the 3 Dimensional model, as explained below, and to see before and after views of the proposed development.

4. General Description of K2Vi

- (a) K2Vi is a software tool which allows the viewer to see a 3D model of a landscape on a computer screen. It is a form of Computer Landscape Modelling and is the latest technique in a continuum of technology development beginning with artists impressions, physical models, and photomontages, to 3D videos, leading to the fully real-time interactive 3 dimensional model presented here. The software contains data which produces a model of the landscape, models of objects currently in the landscape, and models of the proposed modifications to the landscape. The main advancement of this technique is the integration of information from different sources into an interactive three-dimensional model and, because the model is interactive, the proposal can be seen from any and all possible viewpoints.

5. Methodology

- (a) The software produces a "Project Scene" which is the complete three dimensional representation displayed on the computer screen at any time. The K2Vi software uses digital data fed into the software to produce this representation. The model begins with the landscape as it currently exists and further models are then created showing proposed additions to that landscape. It is important to point out that because of technological, cost, and time constraints the Project Scene does not attempt to show every last object on the landscape nor every detail on every object.
- (b) The Project Scene is comprised of the shape of the underlying land which is then draped with aerial photography or other imagery. 3D models are then located within the scene to represent real world objects such as vegetation, existing and proposed buildings, and other structures.
- (c) The K2Vi software uses digital terrain data to form the shape of the underlying land. This is the same data as that used to produce published topographical maps.
- (d) This digital terrain data is then overlaid with an aerial photograph or other texture image (such as a map or plan) of the site to show the ground cover in the project scene. This terrain data overlain with an aerial photograph does not however produce 3 Dimensional images of real world objects (such as vegetation or structures).

- (e) To complete the Project Scene therefore, 3D models of things that are either already in the landscape or proposed to be there in the future are placed in the model. The two main types of models used are vegetation models and models of structures.
- (f) Vegetation models are placed in the scene to show existing or proposed vegetation within the view of the project scene. It was decided not to produce models of vegetation for this project. The project encompasses a wide geographical area which is mostly farmland and it was felt that the Base Model, consisting of digital terrain overlain with aerial photography, provided a suitable model for assessing the visual impact of the proposed windfarm turbines without any vegetation modelling.
- (g) Structure models are models of existing, or proposed new, structures such as buildings. They are typically produced from project drawings and plans using 3D CAD (Computer Aided Design) software or specialised 3D modelling software. These models vary in the amount of detail contained within them depending upon their purpose. For this project, the only other models we placed in the scene were some models of vehicles and people. These models were placed near to two turbines in order to give the viewer a good sense of scale. In my experience, it is not until lay people see objects of known size located close to the turbine models that they are truly able to get an accurate mental impression of the turbine size.
- (h) The models that are mentioned above can be placed in the Project Scene and organised into layers. This allows different components of the project or different options, or in this case the whole proposal, to be switched on and off, or “Toggled”.
- (i) Other types of data can be represented within the scene and in this case, Cadastral data has also been placed into the scene to show the boundaries of the Sunset Views farms.

6. Data Inputs and Data Accuracy

- (a) As with all model constructs, the project scene produced by the software is a picture of the data. The accuracy of this picture is therefore dependant upon the accuracy of this data.
- (b) The digital data used to form the shape of the land is loaded into the model with increasing resolution as the viewer gets closer to the projects area in the following way; The rest of the world is flat, the rest of New

Zealand uses 100m contours, the Waikato and South Auckland areas are modelled using 20m contours supplied by LINZ and the area of the windfarm itself was modelled using 5.0 m contours supplied by Contact Energy.

- (c) The terrain formed from the data described above is then draped with imagery as described below;
- (d) The rest of the world and the rest of New Zealand are draped with a map-like texture produced by a company called GeographX Limited who are located in Wellington. GeographX derived this imagery from the 1:50,000 map series.
- (e) The local area of the proposed windfarm is draped with aerial photography supplied by Contact that has a resolution of 50.0 m per pixel in the near vicinity of the project area and 1.0 m per pixel in the immediate area where the turbines are located. The coverage of this photography is shown in Appendix II – Aerial Photo Coverage.
- (f) As mentioned above, a small number of scaled models of people and vehicles, in this case a Ford Explorer, were placed into the scene to help the viewer gain a good appreciation of the scale of the proposed turbines.
- (g) Finally, models of the new turbines proposed in this Application were placed into the scene. The locations of the turbines were supplied in digital form by Contact Energy. The 3D models used to represent the turbines were stock models of 3 bladed turbines loosely modelled on the Vespa V90 turbine (specifications obtained from http://www.horizonwind.com/images_projects/arrowsmith/permit/ARR_App_4_turbine_Specs.pdf). The models were sized using Contact's submission to have a 100.0 m tower height and 50.0 m blade diameter. The turbine models were set to rotate at random speeds between 10 rpm (revolutions per minute) and 14.4 rpm as per the specifications.

7. Presentation of Model

- (a) The model created by the procedures above can be viewed in a number of ways.
- (b) The K2Vi software also allows the user to “fly around” the scene and to view the subject site from an infinite number of angles. That is, the

subject site can be viewed from any height and any distance, angle or position from the air, sea, or from ground level.

- (c) The software shows the views using a view angle equivalent to the use of a 35mm camera with a 50mm lens which is understood to be consistent with the guidelines for the use of photographs in evidence.
- (d) The Viewpoint is the current geographical location of the viewer in the Project Scene at any time. A readout at the bottom left of the screen shows the position (latitude and longitude) of the current Viewpoint. This display can also show the altitude of the Viewpoint above the terrain and the altitude above Mean Sea Level. A further display shows the compass direction (degrees true) of the Viewpoint to the nearest tenth of one degree of bearing.
- (e) When the mouse cursor is placed in the scene, another display can show the latitude, longitude and altitude of the point that the mouse cursor is covering. This display also shows the distance between the Viewpoint position and the location of the mouse cursor.
- (f) The software includes a measuring tool that allows 3D measurements to be taken between any points within the Project Scene. The measurement display shows the straight line distance between the points being measured as well as the horizontal and vertical distances between the points and the tool can also measure areas.
- (g) Any number of pre-programmed "Viewpoints" can be created. These are exact geographical locations that can be flown to at any time.
- (h) Any number of "Flightpaths" can be created. Flightpaths take the viewer along a pre-programmed flight similar to a virtual helicopter ride.
- (i) As mentioned above, Layers of objects can be turned on and off as required.
- (j) Finally, a timed "Script" can be created which tells the software to go to any Viewpoint, turn any layers on and off, plays any Flightpath etc. In this case a Script has been produced to demonstrate this model which is located in Appendix I of this evidence.
- (k) I will now show run the script demonstrating the model of the proposed Windfarm.

Ernst John Van Der Leden
March 2009

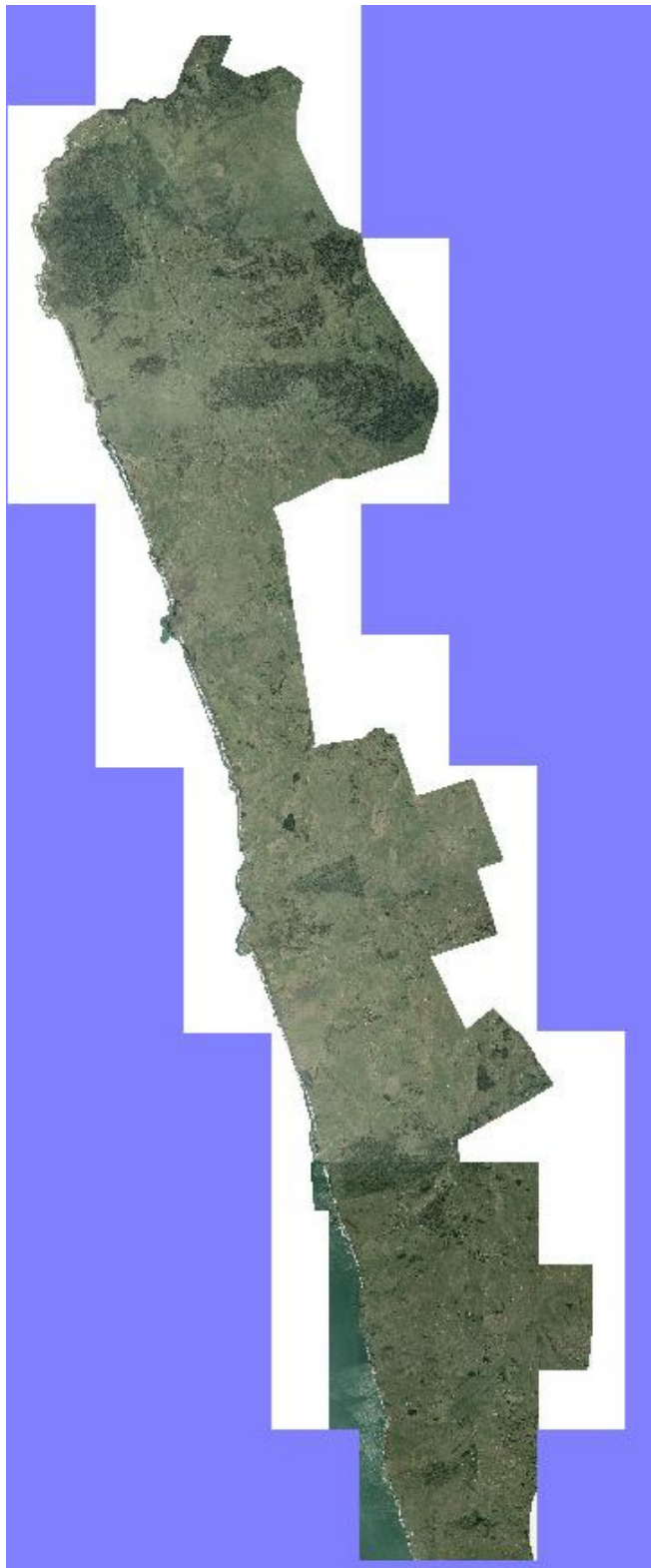
8. Appendix I – Presentation Script

The following is a description of the Script that is loaded into the K2Vi software.

- 1) Open with a flightpath down from high altitude to provide an overview of the scope of the development.
- 2) View of property boundaries including the Sunset View Limited properties.
- 3) Fly to some example objects near towers (people and cars). Showing objects of known size near the towers allows the brain a good opportunity to gain a correct appreciation of their scale.
- 4) Flight out to sea and down to Raglan to show the extent of the proposed windfarm and the pattern of proposed locations.
- 5) Flight down to the Farm Manager's house and a panorama from his front yard.
- 6) Flight over to the Owner's house with a panorama.
- 7) Flight down to a point on the road where tourists commonly stop to take photos. There is a striking rock formation straight ahead.
- 8) Flight over to the Farm Worker's house. Panorama and a view of what the sun looks like as it sets on December 22nd.

9. Appendix II – Aerial Photo Coverage.

Low Resolution Coverage;



High Resolution Coverage;

