

**BEFORE THE COMMISSIONER ON BEHALF OF THE DUNEDIN CITY
COUNCIL**

UNDER	the Resource Management Act 1991
IN THE MATTER	an application for resource consent of LUC-2015-469
BY	Blueskin Energy Limited Applicant

BRIEF OF EVIDENCE OF MICHAEL WILLIAM MOORE

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Introduction

1. My name is Michael William Moore. I hold the degrees of Bachelor of Science from the University of Canterbury, Master of Regional Resource Planning from the University of Otago and the Diploma of Landscape Architecture from Lincoln University. I am a registered member of the New Zealand Institute of Landscape Architects.
2. I have thirty years professional experience and am currently an independent consultant landscape architect based in Dunedin. Prior to this I worked for the Dunedin and Palmerston North City Councils. My work experience includes the preparation of visual and landscape effects assessments, evidence for Council and Environment Court hearings, and site planning and design for development projects. I have also undertaken assessments and mapping to assist in the preparation of landscape protection provisions in District Plans and other statutory documents. I have prepared landscape and visual assessments for numerous wind farm projects of various scales and locations throughout the South Island including, amongst others, Weld Cone, Lulworth and Dominion Salt in Marlborough, Mahinerangi and Mt Stuart in Otago, and Flat Hill in Southland.
3. Although this is not an Environment Court hearing I have read the Environment Court's code of conduct for expert witnesses and I agree to comply with it.

Background

4. In January this year, I was commissioned by the applicant, to undertake a peer review of the landscape assessment, prepared by Lucas Associates. I undertook field inspections during February, and my report, attached as **appendix A**, was completed in March 2016. In order to provide what I considered to be an adequately thorough review, I undertook my own assessment, attached as **appendix B**.
5. My evidence addresses the landscape and visual effects of the proposed development and introduces my peer review report.

6. I understand that the application sought a turbine height envelope of 125m. This has been revised to 90m now that there is some increased certainty about likely turbine models most appropriate for this site.
7. In my report, I discussed the shortcomings (already highlighted in the Lucas report) with the photo-montages that formed part of the original application. The applicant has had revised photo-montages prepared for some of the viewpoints and these are attached as **appendix C**. The new simulations relate to the originals as outlined in **table 1** below:

Table 1

Location	Original simulation number	New simulation number	Comment
State Highway 1 / Pryde Road	1	4	
Pryde Road	2	-	
Church Road	3	3	Note : photo taken from different place
Coast Road	4	2	
Warrington	5	1	
Waitati Bridge	6	-	
Purakaunui Mouth	7	-	
Don's Creek	8	-	

8. The revised photo-montages address my concerns about the accuracy of the visualisations for those viewpoints illustrated, and the methodology applied is outlined in **appendix D**. The turbines now illustrated reflect the amended envelope height and inaccuracies in relation to turbine location have been rectified. I understand that in terms of the locations shown, the revised images are accurate to

approximately 2m, which is the margin of error associated with the GPS readings. This level of accuracy has enabled higher confidence in the analysis of the landscape effects of the turbines.

Key Peer Review Report findings

9. In general, I believe that my assessment of the effects of the proposed wind farm aligns with that of Ms Lucas. I have commented in detail on each section of her report in my report, attached. My summary of the conclusions of the Lucas report are as follows:
 - (a) The integrity of the landform and traditional landscape patterning will be retained (more so than for activities such as a quarry or forestry block).
 - (b) The turbines will introduce a new aspect to the landscape which will be elegant and meaningful.
 - (c) Visual effects are assessed as minor. Views from only one house are toward the cluster.
 - (d) The wind cluster will result in predominantly positive landscape and visual effects due to the sculptural landmark character and associative value as a sustainable community project.
 - (e) The cluster will not significantly adversely affect the North Coast CLPA.
 - (f) In terms of landscape, visual and natural character effects the cluster is assessed as appropriate.
10. I am in broad agreement with these conclusions. As discussed however, and as more fully outlined in my own assessment (Appendix A of my report), I would prefer to characterize the visual effects of the wind farm as variable in nature and magnitude depending on the perceptions of the individual viewer and on the level of screening and proximity to the site.
11. My own conclusions are as follows:
 - (a) Porteous Hill is not an outstanding natural feature, nor within an outstanding natural landscape. Although its eastern slopes are

within the NCCLPA in the District Plan, the 'coastal environment' as identified in the 2GP is approximately 2km distant. The site is at the edge of an area identified as a 'significant natural landscape' in the 2GP. In my assessment its landscape and rural amenity values are based on a moderate - highly coherent natural landform, the presence of areas of indigenous vegetation, its open, traditional pastoral farming character and the low impact of built elements. The hilltop is a visually sensitive location, forming the skyline from many areas surrounding and this is recognized by the 'ridgeline' notation in the 2GP.

- (b) Other than the turbines, there are no other elements involved with the development that will have more than temporary potentially significant landscape or visual effects. Features of the proposal that will avoid or mitigate adverse landscape and visual effects include:
 - (i) the modified rural character of the area;
 - (ii) the ability to undertake the development without significant change to landforms, vegetation cover or rural land use;
 - (iii) the modest scale of the wind farm as a whole and of the turbines themselves - which will not dominate Porteous Hill; and
 - (iv) the sculptural, elegant character of the turbines.
- (c) Whether the wind farm is seen as a positive or negative addition to the landscape will depend on the individual viewer. In my opinion, it will contribute positively by enhancing memorability and will integrate readily with the working rural character of the landscape. The magnitude of the visual effects will vary with degree of screening and proximity to the site. My detailed assessment is provided in my report. In summary however, the significant viewpoints from which there will be more than moderate impact are limited to an approximately 1km stretch of State Highway 1 north of Pryde Road, Pryde Road and the three

houses located adjacent, and the dwelling at 2197 Waikouaiti Waitati Road.

12. My report contains a detailed assessment of the landscape and visual effects of the proposal against the relevant statutory planning provisions. My overall conclusion is that the proposal is consistent with these.

Comment on the revised photo-simulations

13. I have reviewed my assessment with the benefit of the revised, more accurate photo-simulations for original viewpoints 1, 3, 4 and 5 and confirm that my conclusions remain unchanged.

Issues arising from the Council reports and submissions

14. I have no particular issues with the Council officer's reports, and find myself in general agreement with Barry Knox, Council's Senior Landscape Architect.
15. A common theme in the Council Planner and Landscape Architect's reports, and in submissions, is that visual amenity effects assessments are subjective. I agree that this is the case but have attempted, in my assessment, to maximise clarity about what can be objectively described, and what requires a subjective judgement. I believe that the visual effects from particular viewpoints can be fairly objectively forecast and described (aided by the photo-simulations), and that the magnitude of the proposed change (involving considerations of relative scale, degree of screening and contrast with the existing environment and effect on key features) can also be described with a fair degree of objectivity. What I have described as the 'nature' of the effect (whether positive, neutral or adverse) is where the bulk of the subjectivity arises and is dependent upon the attitudes of the individual viewer. Effects on natural character (i.e. the effects on the natural elements, forms and processes of the land) can be more objectively described than effects on visual amenity values, which reside with the viewer.

Conclusion

16. It is my conclusion that in terms of landscape and visual effects, the proposed wind farm will integrate acceptably with the Porteous Hill landscape.



Michael William Moore

Registered NZILA Landscape Architect

2 May 2016

Appendix A

Blueskin Wind Farm Landscape Assessment Peer Review Report

9 March 2016



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Introduction

Blueskin Energy Limited has applied for Resource Consent to develop a small wind farm on Porteous Hill, north of Blueskin Bay, to the north of Dunedin. The purpose of this report is to peer review the applicants landscape assessment report prepared by Lucas Associates, dated 2015. In order to provide an adequate review, I have undertaken my own assessment, which is outlined in Appendix A.

The following are my comments on each section of the Lucas report, using the section headings in that report.

Proposal

This section describes the proposed development and notes that whilst an envelope approach for turbines up to 102m is sought, the Gamesa G58 turbine, with a full height to rotor tip of 83m, has been used in the photomontages.

In my assessment, whilst I understand that the most likely turbine to be used will be in the order of 80 – 85m high, there is a potential weakness here as approval is sought for turbines that could be almost 20m higher. I suggest that a more robust approach would have been to either refine the application parameters or to illustrate the worst case scenario.

For completeness, I believe it would have been useful to have also outlined the other aspects associated with wind farm development – i.e. the earthworks required for construction and access, the transmission lines and aviation lighting, although I accept that the effects of these are not likely to be significant.

Methodology

The overall method of assessment briefly outlined, is reasonably standard and is appropriate. More detail on the steps involved in assessing the landscape and visual effects, perhaps including explicit rating scales, may have added clarity.

This section makes reference to the visual simulations and the method employed in their preparation and notes that the location of the towers is approximate only. Appendix 1 to the report, discusses the process of developing the simulations and appropriately highlights that there are inaccuracies in the turbine locations illustrated. The appendix notes that the method employed is not 'the formal photo montage process' and that the simulations are intended 'to give a rough idea rather than a precise picture'.

Whilst it would have been useful to have more precise images, it is my assessment that the simulations prepared still provide a helpful guide and are acceptably reliable as regards the scale of the turbines in the landscape, particularly as far as the more distant viewpoints are concerned. I note that the envelope approach adopted in the application means that assessing the effects based on illustrations of the turbines on precise locations would still require some interpretation.

Inaccuracies regarding placement are more of an issue when illustrating the effects from closer viewpoints and whilst turbine scale appears to be approximately correct, in some instances, the degree of landform screening based on the mapped turbine locations, can be misleading. Also, I believe that Simulation 4 (Coast Road, Seacliff) underplays the visual effects of the proposed turbines in terms of contrast with and visibility against the sky.

If at all possible, in order to minimize criticism and debate about the nature of the visual effects, it is my recommendation that more accurate images are prepared.

Location

This section accurately describes the location of the site in relation to features and localities in the area surrounding.

Planning status

This section discusses the Dunedin City District Plan activity status of the proposal, noting that it is a discretionary activity in the Rural zone and restricted discretionary in terms of the North Coast Coastal Landscape Preservation Area overlay. It is my understanding however, that the overall activity status is Non-Complying as per Rule 6.5.7.

Land typing

This section describes the geology and geomorphology of the area, providing useful background to an understanding the character of the landscape.

Coastal Landscape

This section describes the views of Porteous Hill from various areas surrounding and the character of the landscape. My summary of the key points arising is:

- *Porteous Hill contributes to the inland hill backdrop from coastal areas in the area surrounding, forming a skyline landform.*
- *The coastal landscape is very much a working landscape. Natural slopes and regenerating native bush cover contribute importantly to the matrix of working and living elements. It is a landscape with considerable visual interest.*
- *Porteous Hill has moderate naturalness.*

I am in broad agreement with this assessment.

Highway corridor

This section accurately describes the views of Porteous Hill from State Highway 1.

Wind cluster effects

This section of the report lays out the relevant planning provisions that will be addressed, including RMA s6(a), 7(c) and 7(j), NZCPS Policies 6 and 13 and the relevant Operative Dunedin City District Plan assessment matters for the rural and landscape sections. Whilst I believe that there are additional assessment matters not specifically considered that are also relevant, and query the relevance of the NZCPS and RMA s6(a), the matters addressed effectively cover the substance of landscape and visual matters to be assessed. I note that the Proposed Dunedin City District Plan (2GP) has not been considered but considering that it is still in its early stages and that little weight can yet be given to it, this is not of particular moment.

Rural zone

This section addresses the Dunedin City District Plan Rural section assessment matter 6.7.13 (Visual Impact). My summary of the key conclusions of this section of the report is as follows:

In terms of the visual impact on rural character, the report states that the wind farm will be a novel, utilitarian element within the working rural landscape. It is assessed as being compatible with the production rural landscape character and considering its scale, will read as a community generation facility servicing the surrounding area. Visual effects on the character of the rural landscape are assessed as either 'not adverse' or negligible adverse.

As outlined in more detail in Appendix A, I am in broad agreement with this assessment.

In relation to the impact on visual amenity, the key conclusions are:

- *There are 8 houses within 1.5 km of the site and from most of these the turbines will not be visible. Seen from the Pryde Road area they will 'protrude gracefully to hover over the hilltop'*
- *From State Highway 1 the wind farm will be glimpsed only briefly, will provide a point of interest and be a largely positive effect.*
- *From the coastal side the turbines will appear as 'graceful, sculptural structures'.*
- *From the Church Road area the turbines will contribute to the complexity of the working landscape and will be seen as 'a sculptural presence'.*
- *From Coast Road and the rail line near Seacliff, given the coastal views and complex terrain and land cover inland, the turbines will be a minor component of the landscape and have an insignificant presence.*
- *From around Warrington, the turbines will integrate with the complex landscape.*
- *From the coast south of Blueskin Bay the turbines will be seen as a 'graceful and elegant group' and their visual effects will be mitigated by distance.*
- *Generally, the fact that the wind farm will be a locally owned community installation will colour the viewer's perception, making it more positive than if they were an external corporate's installation.*
- *Overall, adverse visual effects are assessed as being of only minor significance.*

I agree that visibility is generally low from the houses closest to the wind farm site but note that the residents in the Pryde Road area have submitted in opposition to the application and may not identify with the description of the turbines as 'gracefully hovering' over the hilltop. In my assessment, the magnitude of visual effects from this area is moderate – significant due to the proximity.

I agree generally with the assessment of effects from State Highway 1, from viewpoints on the coastal side of the hill and viewpoints south of Blueskin Bay, noting again however that some viewers will have a less positive reaction to the turbines on the hilltop. I would rate the visual effects from Coast Road and the railway near Seacliff as moderate rather than 'insignificant'. I agree that the turbines will integrate acceptably with the landscape character as viewed from around Warrington.

I think that the report is probably correct in noting that the community ownership is likely to positively colour the viewer's perceptions of the facility, but believe that this will only apply to locals, aware of the ownership arrangements, and should not be overstated. Rather than overall visual effects being described as of only minor significance, I would express them as variable in nature and magnitude depending on the perceptions of the individual viewer and on the level of screening and proximity to the site. My own conclusion is that the wind farm will integrate acceptably with the character of the rural landscape and will have generally positive effects on visual amenity values.

In relation to the visual impact on significant views, the key conclusions are:

- *There will be views of the wind cluster from State Highway 1 between Pullar and Pryde Roads, 1km away.*
- *From Coast Road and the railway the turbines will be seen on the hill summit but due to the coastal focus, the broken terrain, vegetation and distance, will not be particularly prominent and may be perceived as a positive contribution to a sustainable landscape.*
- *From Pryde Road, the turbines, less than 1km away will be a substantial presence and assessed to be significant.*
- *From Church Road, the turbines will be over 2km distant and will add elegance and dynamism to the landscape.*
- *From Warrington Beach the wind farm will be seen in the context of the complex land use mosaic of the mid and lower slopes of Porteous Hill. Due to the visual complexity and shelterbelts, the turbines will not be particularly prominent and are assessed to not have significant adverse effects.*
- *From south of Blueskin Bay (Waitati bridge, Doctors Point and Purakaunui) the structures will be more than 5km distant displayed variously on the skyline. They will appear elegant structures standing lightly on the land and not disruptive of important views of the coastal hills.*
- *From higher on the slopes to the south the turbines will occasionally be visually distinctive when they 'catch the light' but at other times will be scarcely evident. The small group of turbines will appear as 'a logical component of this landscape'. They will not have adverse effects on the significant panoramic views.*

I am in substantial agreement with this, noting again however that it must be acknowledged that individual perceptions of the nature of the contribution of the turbines to the landscape will be variable.

As regards the effect of the activity on the open amenity of the rural area, the report states that the wind cluster will change the character of the summit but will not disrupt the open amenity of the rural landscape. The effect of the wind cluster is assessed as predominantly positive and that any perceived negative effects would be negligible.

As assessed more fully in Appendix A, I am in substantial agreement with this. My main proviso is that I believe that for some viewers the perceived negative effects of three large utilitarian structures on the hilltop would be considerably more than negligible. My assessment however, is that the slimness and lightness of the turbines and the minimal effects on landform, pasture cover and rural land use, means that the open rural landscape continues to flow through the wind farm.

Coastal landscape protection area

This section addresses Dunedin City District Plan Rural Section assessment matter 6.7.4 as regards cumulative effects on Landscape Management Areas - in this case, the North Coast Coastal Landscape Preservation Area (NCCLPA). The conclusion is that no adverse cumulative effects have been identified.

In my assessment, although the turbines will be located beyond the NCCLPA boundary, they will have adverse effects on the naturalness of the skyline defining the wider coastal landscape. The magnitude of these effects will be limited in my opinion, due to the fact that the turbines will be seen within a significantly modified rural landscape context. As there are no other similarly significant utilitarian structures within or near the NCCLPA in this vicinity, I do not consider that these affects can be considered to be cumulative.

Assessment Matters

This section assesses the effects of the proposed development against the Dunedin City District Plan Landscape Section assessment matters (Section 14.7). My summary of the key conclusions is as follows:

14.7.1 Visibility

This section summarizes assessments of visibility and visual effects made earlier in the report. I agree with the assessments outlined.

14.7.2 Adverse effects

Adverse effects are assessed as negligible due to avoidance and mitigation undertaken in the design process. The key avoidance / mitigation factors discussed are:

- *The complex terrain and landscape context of the site*
- *Community ownership*
- *Three turbines arranged in a triangle provides for a pleasing aesthetic*
- *The identical, three blade turbines have a graceful appearance*
- *The mid-size turbine scale fits well with local landforms and tree cover and will not particularly dominate.*

In my assessment, there will be some adverse effects of the project that would have to be considered more than negligible, however, I am in general agreement with the avoidance and mitigation factors discussed. As discussed previously, I believe that awareness of community ownership should not be overstated and consider that the small overall scale (three turbines only) is more relevant. Also (although a minor point), I would place more emphasis on the fact that the layout appropriately responds to the scale and form of the broad summit of the hill, rather than the aesthetic of the triangular layout.

14.7.3 Sympathetic siting and design

The report states that the wind cluster is considered to have 'a much lesser visual effect' than farm and shelter plantings, provided for in the permitted baseline. The cluster siting and design is assessed as 'entirely sympathetic to the forms, character, and scale of the Porteous Hill landscape'.

I agree partially, with the comments about the relative impacts of the proposed wind farm and activities such as plantings, provided for in the permitted baseline. Large scale

exotic plantings, following cadastral rather than natural boundary lines can obscure landform coherence in a way that the wind farm will not. On the other hand, plantings are generally considered more natural and are more clearly a part of the rural vernacular. I agree that the wind farm will be sympathetic to the forms, character, and scale of the Porteous Hill landscape.

14.7.4 Landscape features and characteristics

Without addressing the matters listed in Section 14.5.2 (a) (ii) in any detail, the report states that the wind cluster activity 'will not adversely impact on any important landscape features that are to be protected, preserved or conserved'.

I am somewhat more reserved in my assessment. Porteous Hill defines the skyline and extent of the wider coastal landscape as viewed from many places in the area surrounding. The wind farm will introduce a significant new built element to the hilltop, thereby modifying natural character to an extent. It is my assessment however, that natural character effects will be minor because the turbines will contrast with, rather than intrinsically alter, natural elements in the landscape, and because the landscape character of Porteous Hill is already significantly modified by rural land use. There will be no significant adverse effect on landform and no effect whatsoever on streams or remaining indigenous vegetation. Given the rural character and significant distance from the coast itself, I believe that the proposed wind farm will integrate acceptably with its setting.

14.7.5 Compatibility of scale and character

The conclusion in the report is that the proposed development is 'entirely compatible with the landscape in terms of its scale and character and I am in substantial agreement.

Coastal environment

This section of the report addresses the preservation of natural character issues arising from the Resource Management Act Section 6(a) and the New Zealand Coastal Policy

Statement Policy 13 as well as the relevant provisions in the Landscape section of the Dunedin City District Plan. The key conclusion is that ‘due to the mosaic of buildings and plantings, the site and coastal slopes to Porteous Hill are assessed to have neither outstanding nor high natural character’ (as per Policy 13 of the NZCPS).

I agree with this assessment but query the relevance of the provisions relating to the coastal environment to this site and application. Although the site is partially within the North Coast Coastal Landscape Preservation Area (NCCLPA) in the Operative Dunedin City District Plan, it is my opinion that (whilst it may be considered coastal hinterland) in terms of Policy 1 in the NZCPS, it is not within the coastal environment. The delineation of the coastal environment in the 2GP supports this view.

Summary

My summary of the key summary conclusions of the Lucas report are as follows:

- *The integrity of the landform and traditional landscape patterning will be retained (more so than for activities such as a quarry or forestry block).*
- *The turbines will introduce a new aspect to the landscape which will be elegant and meaningful.*
- *Visual effects are assessed as minor. Views from only one house are toward the cluster.*
- *The wind cluster will result in predominantly positive landscape and visual effects due to the sculptural landmark character and associative value as a sustainable community project.*
- *The cluster will not significantly adversely affect the North Coast CLPA.*
- *In terms of landscape, visual and natural character effects the cluster is assessed as appropriate.*

I am in broad agreement with these conclusions. As discussed however, and as more fully outlined in Appendix A, I would prefer to characterize the effects of the wind farm as variable in nature and magnitude depending on the perceptions of the individual viewer and on the level of screening and proximity to the site. My own conclusion is that the wind farm will integrate acceptably with the character of the rural landscape and will have generally positive effects on visual amenity values. The magnitude of the visual effects will vary with degree of screening and proximity to the site. In my assessment

significant viewpoints from which there will be more than moderate impact, are limited to an approximately 1km stretch of State Highway 1, north of Pryde Road, Pryde Road and the three houses located adjacent and the dwelling at 2197 Waikouaiti Waitati Road.

Mike Moore

Registered NZILA Landscape Architect

Appendix B

Appendix A

MIKE MOORE

BSc, Dip LA, MRRP, ANZILA

LANDSCAPE ARCHITECT

Blueskin Wind Farm: Landscape and Visual Impact Assessment

Site and area description

The site for the proposed wind farm is the summit of Porteous Hill, approximately 400m asl and 2km north of Warrington on the northern side of Blueskin Bay. The hill summit is approximately 2.5km from the coastline within Blueskin Bay and 2km from the open coast north of Warrington. State Highway 1 runs approximately 700m to the west and Coast Road and the railway line are approximately 1.5km to the east / south-east. The settlement of Seacliff lies some 3.3km to the northeast. In terms of visibility, the primary landscape context of the site is the Blueskin Bay catchment including seaward facing areas to the north as far as Brinns Point and to the south as far as Heyward Point. To the north Hammond Hill (436m) and the ridges forming the watershed boundary with the Waikouaiti River catchment form an effective screen.

Porteous Hill is a loess covered volcanic hill representing a basaltic intrusion through schist and slump prone sedimentary rocks. It has a broad gently rolling summit which falls away more steeply below, particularly to the north and west. The hilltop is pasture covered and open, and there is considerable outcropping of rock. Apart from farm fences and an anemometer mast, there are no structures present on the hilltop at present. Access is via Porteous Road, a minor farm access road. The mid – lower slopes to the south and east are a more complex patchwork of pasture, native and exotic scrub, exotic woodlots and shelterbelts, and scattered native trees. Rural buildings are dotted about sparsely. The slopes to the north and east are generally more dominantly pasture covered. There is a significant area of native bush on the north-east side of the hill.

Landscape and visual amenity values

The following assessment of landscape values uses the ‘amended Pigeon Bay factors’ as a framework.

Natural science / Expressiveness values

The open pastoral character of the Porteous Hill summit makes the natural landforms legible and the rock outcrops highlight the volcanic origins of this landform. More widely, the presence of native bush and trees on the coastal facing slopes is expressive of the natural vegetation character of this landscape.

Aesthetic values

Porteous Hill is part of a modified rural landscape but has moderate – high naturalness values based on the coherence of the natural landforms and dominance of natural over built elements (in particular in the summit area). Natural character values are enhanced on the coastal facing slopes where native trees and areas of native bush are present. Porteous Hill contributes to the attractive rural setting to Blueskin Bay but does not stand out particularly as a highly memorable feature within this landscape.

Transient values

None particularly noted

Shared and recognized values

The coast facing slopes of Porteous Hill are within the North Coast Coastal Landscape Preservation Area (NCCLPA) in the Dunedin City District Plan. This overlay recognizes and seeks to protect natural character values. In the Proposed Dunedin City 2GP this area is within the Seacliff Significant Natural Landscape (SNL). This recognizes and seeks to protect natural, cultural / historic and aesthetic / amenity values. Those considered relevant to Porteous Hill are the natural landforms, natural character and rural amenity values – in particular indigenous vegetation cover, and the values of the

hill as an attractive backdrop in coastal views. The 2GP maps also identify Porteous Hill as part of a (visually sensitive) ‘ridgeline’.

Tangata whenua values

The coast in this area is acknowledged as having significant values to tangata whenua. Whilst Porteous Hill forms part of the skyline behind the coast, the hill itself is not noted as having particular significance in the statutory documents.

Historic heritage values

I am unaware of any particular historic significance associated with Porteous Hill. In general however, the landscape expresses a land use history of traditional pastoral farming.

Landscape values - summary

Porteous Hill is not an outstanding natural feature, nor within an outstanding natural landscape. Although its eastern slopes are within the NCCLPA in the District Plan, the ‘coastal environment’ as identified in the 2GP is approximately 2km distant. The site is at the edge of an area identified as a ‘significant natural landscape’ in the 2GP. In my assessment its landscape and rural amenity values are based on a moderate – highly coherent natural landform, the presence of areas of indigenous vegetation, its open, traditional pastoral farming character and the low impact of built elements. The hilltop is a visually sensitive location, forming the skyline from many areas surrounding and this is recognized by the ‘ridgeline’ notation in the 2GP.

Description of the proposed development

The proposed development involves the following elements that will potentially have landscape and visual effects:

- The erection of three, three blade wind turbines with a height (to turbine tip) of 80 - 102m. It is my understanding that the turbine selected is most likely to be 80 – 85m high and the Gemesa G58 turbine has been modelled in the photomontages provided in the Lucas report. The proposed turbine locations indicated on the plans are subject to refinement in response to the final turbine choice.
- The improvement of the existing farm access road to the site (involving some vegetation removal and battering at a few sharp bends, and some localized widening) and the formation of metaled access tracks on the site over existing farm tracks.
- Earthworks required for the turbine foundations and construction laydown areas (approx. 40 x 20m). These will be revegetated following commissioning.
- The transmission line cable to the existing 33kV line near State Highway 1 will be installed mainly below ground except that the lower 100m will be overhead on poles.
- The establishment of temporary facilities and storage of equipment during the construction phase.

At least one of the turbines will have aviation lighting attached. This has the potential to generate night time visual effects but it is my understanding that any lighting will be shielded to avoid any visibility from lower viewpoints.

Features of the proposal that assist to integrate with the landscape and to minimize adverse landscape character and visual effects are as follows:

- The site is within a working rural landscape context where natural landscape values are already modified by agricultural land use. This context assists in minimizing the impact of the proposed wind farm on natural landscape values.
- The site character is such that the wind farm can be developed without significant disruption to natural landforms. This is because the access road already largely exists and because the topography is gentle. The site vegetation has already been highly modified by farming practices. The proposed re-grassing following construction will quickly remedy any adverse visual effects associated with earthworks.

- With three turbines at 80 – 102m in height, the scale of the wind farm is modest. Seen in the context of Porteous Hill as a whole e.g. from the southern side of Blueskin Bay, the wind farm will certainly not dominate the landform and are confined to the gentler summit area, not spreading over the hill forms generally.
- With three blades and slender tubular poles, the design and appearance of the turbines is elegant and sculptural. Three structures also provides for a well-balanced group visually. The proposed light grey colour finish is typical for wind turbines as it assists to minimize contrast with sky colours.

Biophysical landscape effects

Once the construction phase is over, the proposed wind farm will have minimal effect on the existing landform, vegetation cover and agricultural land use on the site. Whilst significant new built elements will be introduced, the existing landscape forms and processes will continue to operate as at present, with the wind farm being seen as an additional (see-through) layer of production imposed on (or above) the current rural landscape.

Visual effects assessment

Visibility

Figures 1 and 2 are visibility maps based on overall turbine heights of 83m and 102m respectively, prepared by Energy3 Ltd using 'Windfarm' software. The maps focus on the area within 15km of the site and illustrate blade tip visibility. This is based on landform only (10m contours), and overstates visibility to the extent that screening by vegetation is not taken into account. Appendix A1 outlines the methods used in the preparation of these maps.

Photo-simulations

The Lucas report refers to photo simulations prepared by others but reviewed and used as part of the landscape assessment. Appendix 1 in that report discusses the method used in preparing the simulations and notes that there are some inaccuracies in turbine placement and that the simulations are intended as a rough guide rather than a precise picture. Whilst it would have been useful to have more precise images, it is my assessment that the simulations prepared still provide a helpful guide and are acceptably reliable as regards the scale of the turbines in the landscape particularly as far as the more distant viewpoints are concerned. I note that the envelope approach adopted in the application means that assessing the effects based on illustrations of the turbines on precise locations would still require some interpretation.

Inaccuracies regarding placement are more of an issue when illustrating the effects from closer viewpoints and whilst turbine scale appears to be approximately correct, in some instances, the degree of landform screening can be misleading. I believe that Simulation 4 (Coast Road, Seacliff) underplays the visual effects of the proposed turbines to some extent in terms of contrast with and visibility against the sky.

Assessment method

The following assessment of the visual effects of the proposed wind farm adopts the method and terminology outlined below:

1. Identify the viewpoints to assess, record the reasons for their significance and assess the likely sensitivity of the viewers to change.
2. Describe the visual effects of the proposal
3. Assess the nature and significance of the visual effect with reference to the following explicit scales and their common English meanings:

Nature of effect

- *Positive*
- *Neutral*
- *Adverse*

Magnitude of effect

- *Highly significant*
- *Significant*
- *Moderate*
- *Minor*
- *Negligible*

Viewpoint assessment

Areas over 8km to the south

The windfarm will be visible at distances of up to 13km and more from the hills to the south of Blueskin Bay including such significant viewpoints as State Highway 1, Mt Cargill Road, Blueskin Road, Purakaunui Road, Heyward Point Road. There are numerous houses in this area and the Lucas report includes a photo-simulation from Don's Creek which is broadly representative of effects from this area generally. It is likely that people viewing the wind farm from this area will have a wide range of attitudes and sensitivity toward the wind farm.

Description of visual effects:

Porteous Hill is moderately prominent in views across Blueskin Bay from this area and forms part of the setting of rural hills enclosing the bay. From more easterly viewpoints (e.g. Heyward Point Road) it is seen as the backdrop to the open coast and Warrington Beach. The proposed development will introduce a new element into the landscape and will generally be seen on the skyline. The vertical form, significant scale and movement of the turbines will mean that they are seen as minor focal points from this distance. The magnitude of the visual effects will vary with atmospheric and lighting effects and will increase with proximity.

Nature and magnitude of visual effects:

Viewers will have a range of opinions as to whether the wind farm is a positive, neutral or adverse addition to the landscape. For some people the sight of turbines in motion on the hilltop will be positive, representing environmentally friendly power generation and appearing as elegant sculptural elements in pleasing contrast to their natural setting. For others however, they may be seen as foreign utilitarian elements cluttering the natural skyline. In my assessment the nature of the visual effects of the wind farm will be positive. I believe it will integrate acceptably in the working rural landscape context and will introduce an appropriate new feature of interest. Naturalness will be reduced but not significantly, given the modified rural character and because the turbines will be seen as a transparent layer with minimal effect on the landform, vegetation and agricultural land use. Given the viewing distances involved, the magnitude of the visual effects will be minor – moderate from this area.

Areas between 8km and 3km to the south

Significant viewpoints between 8 and 3km to the south of the site include State Highway 1, the railway, the settlements of Waitati, Doctors Point and Purakaunui, and numerous residential dwellings. The Lucas report includes photo-montages from Waitati Bridge and Purakaunui which are broadly representative of effects from this area generally. It is likely that people viewing the wind farm from this area will have a wide range of attitudes and sensitivity toward the wind farm.

Description of visual effects:

Porteous Hill is prominent in northward views from this area, defining the northern skyline across Blueskin Bay as viewed from State Highway 1, Waitati and Doctors Point, and the backdrop to the open coast behind Warrington as viewed from Purakaunui. The proposed development will introduce a new element into the landscape and will generally be seen on the skyline. The vertical form, significant scale, dynamism of the turbines and location on a local high point will mean that they are seen as a focus. The scale of the visual effects will vary with atmospheric and lighting effects and will increase with proximity.

Nature and magnitude of visual effects:

As discussed above, viewers will have a range of opinions as to whether the wind farm is a positive, neutral or adverse addition to the landscape. In my assessment the nature of the visual effects of the wind farm will be positive. I believe it will integrate acceptably in the working rural landscape context and will introduce an appropriate new feature of interest. Naturalness will be reduced but not significantly, given the modified rural character and because the turbines will be seen as a transparent layer with minimal effect on the landform, vegetation and agricultural land use. Three moderately scaled turbines will emphasise the summit of Porteous Hill but will not dominate the natural hill form. In my opinion the magnitude of the visual effects will be moderate from this area.

Seacliff

The settlement of Seacliff is just over 3km to the north-east of the site and there are views toward Porteous hill from this area including Coast Road and the railway nearby. The Lucas report includes a photo-montage from Coast Road in this vicinity, which is broadly representative of effects from this area (I have already noted that I believe that this simulation rather underplays the visibility of the proposed turbines against the sky). It is likely that people viewing the wind farm from this area will have a wide range of attitudes and sensitivity toward the wind farm.

Description of visual effects:

Where visible, Porteous Hill forms part of the western skyline from this area. Its character is rural but there are moderately high natural character values based on the presence of a significant patch of native bush below the summit as well as scattered native trees within the paddocks on the hill slopes. The proposed development would introduce three turbines to the hill summit. The vertical form, significant scale, dynamism of the turbines and location on a local high point will mean that they are seen as a focus. The scale of the visual effects will vary with atmospheric and lighting effects.

Nature and magnitude of visual effects:

As discussed, viewers will have a range of opinions as to whether the wind farm is a positive, neutral or adverse addition to the landscape. In my assessment the nature of the visual effects of the wind farm will be positive. I believe it will integrate acceptably in the working rural landscape context and will introduce an appropriate new feature of interest. Naturalness will be reduced but not significantly, given the modified rural character and because the turbines will be seen as a transparent layer with minimal effect on the landform, vegetation and agricultural land use. Three moderately scaled turbines will emphasise the summit of Porteous Hill but will not dominate the natural hill form. In my opinion the magnitude of the visual effects will be moderate from this area.

Coast Road

Coast Road runs around the lower slopes of Porteous Hill and is between 1.5 and 3km from the site. The railway line follows a similar route adjacent. Visibility of the site from Coast Road is variable and considerably screened for much of its length by intervening landform and vegetation, particularly at the southern end. The summit becomes more visible nearer Seacliff. The orientation of the land and views is mainly seaward rather than toward Porteous Hill. As discussed above, the Lucas report includes a photo-montage from Coast Road near Seacliff. It is likely that people viewing the wind farm from this area will have a wide range of attitudes and sensitivity toward the wind farm.

Description of visual effects:

Where visible, Porteous Hill forms part of the north-western skyline from this area. Its character is rural but there are moderately high natural character values based on the presence of a significant patch of native bush below the summit as well as scattered native trees within the paddocks on the hill slopes. The proposed development would introduce three turbines to the hill summit but the summit is set back some distance from the top of a scarp which is viewed on or near the skyline. The vertical form, significant scale, dynamism of the turbines and location on a local high point will mean that they are seen as a focal point to some extent. The scale of the visual effects will vary with atmospheric and lighting effects.

Nature and magnitude of visual effects:

As discussed, viewers will have a range of opinions as to whether the wind farm is a positive, neutral or adverse addition to the landscape. In my assessment the nature of the visual effects of the wind farm will be positive. I believe it will integrate acceptably in the working rural landscape context and will introduce an appropriate new feature of interest. Naturalness will be reduced but not significantly, given the modified rural character and because the turbines will be seen as a transparent layer with minimal effect on the landform, vegetation and agricultural land use. Three moderately scaled turbines will emphasise the summit of Porteous Hill but will not dominate the natural hill form. In my opinion the magnitude of the visual effects will be moderate from this area.

Warrington

The settlement of Warrington is approximately 2 – 3km from the proposed wind farm site. There are numerous houses in this locality potentially visually impacted by the wind farm, and the Warrington beach is a popular recreational destination. It is likely that people viewing the wind farm from this area will have a wide range of attitudes and sensitivity toward the wind farm.

The Lucas report includes a photo-montage from Warrington to represent the effects of the proposed development from this area. As noted in the report, there are inaccuracies in the illustration of the turbine siting and I believe that the visual effects illustrated are unlikely to be an entirely reliable guide in this instance.

Description of visual effects:

Porteous Hill forms the northern backdrop and skyline from Warrington. The shape of the hill is such that the summit is screened by lower landform and vegetation from most places. The hill slopes facing the township are rural but characterised by a patchwork of woodlots, shelterbelts and areas of scrub. A more open rural character is evident higher on the slopes. Depending on specific viewpoint, the turbines will be entirely or partially screened by landform and vegetation to varying extents. The partial screening helps to

minimize the scale and prominence of the development but where visible, the skyline location and movement of the rotors will attract attention. The scale of the visual effects will vary with atmospheric and lighting effects.

Nature and magnitude of visual effects:

As discussed, viewers will have a range of opinions as to whether the wind farm is a positive, neutral or adverse addition to the landscape. In my assessment the nature of the visual effects of the wind farm will be generally positive. I believe it will integrate acceptably in the context of the working rural landscape background to the settlement and will introduce an appropriate new feature of interest. The naturalness of the hill backdrop will be reduced but not significantly, given the modified rural character. It is possible that visibility of the tips of moving rotors without seeing the turbine in its entirety could be considered a possible irritant and a less satisfactory effect than a view of the whole turbine, but overall it is my opinion that the nature of the visual effects of the windfarm will be positive and that the magnitude of the visual effects will be moderate.

State Highway 1 within 3km of the site

North of Evansdale the proposed wind farm will be largely screened by landform and this screening will be further reinforced by vegetation. There is one area however, in the vicinity of the Pryde Road intersection and approximately 1 km northward, from which the Porteous Hill summit can be seen. The viewing distance is approximately 800m – 1.8km. Viewers will be travelers on the highway and the wind farm will be more prominent within the field of view southbound rather than northbound. Viewers will have a wide range of attitudes and sensitivity toward the wind farm.

The Lucas report includes a photo-montage from State Highway 1 by the Pryde Road intersection to represent the effects of the proposed development from this area. Whilst there are inaccuracies in the illustration of the turbine siting (as noted in the report) I believe that this simulation gives a reasonable indication of the scale and character of the effects from this viewpoint.

Description of visual effects:

Porteous Hill is seen defining the south-eastern skyline from this viewpoint. Its character is open and pastoral. Two of the turbines will be significantly visible and it is likely that the tip of the third will also be visible from the more distant end of this stretch. The turbines are likely to attract the attention of southbound travelers particularly, for whom the hill will be within the periphery of their main view focus. Where visible, the turbines will have a substantial visual impact and will be seen as a point of interest due to their significant scale, vertical form and moving rotors. Generally however, due to screening, visual impact from State Highway 1 within 3 km of the site will be modest.

Nature and magnitude of visual effects:

As discussed, viewers will have a range of opinions as to whether the wind farm is a positive, neutral or adverse addition to the landscape. In my assessment the nature of the visual effects of the wind farm will be generally positive. I believe it will integrate acceptably in the context of the working rural landscape and will introduce an appropriate new feature of interest. The naturalness of the hill backdrop will be reduced but not significantly, given the modified rural character. It is my opinion that the magnitude of the visual effects will be significant for the short section from which the wind farm will be visible but overall, considering the level of screening, minor - moderate.

Church Road

Porteous Hill summit is visible from the eastern part of Church Road at distances of between approximately 1.5 and 1.7km. Church Road is a minor rural access road and most viewers on this route are likely to be local residents. The likely visual effects of the proposed wind farm are illustrated in a photo-montage in the Lucas report. I believe that this provides a reasonably accurate indication of the scale and character of the effects. As indicated turbine 1 will be partially screened by landform.

Description of visual effects:

Porteous Hill forms part of the south-western skyline from this area. Its character is rural but there are moderately high natural character values based on the presence of a significant patch of native bush below the summit as well as scattered native trees within the paddocks on the hill slopes. The proposed development would introduce three turbines to the hill summit. The vertical form, significant scale, dynamism of the turbines and location on a local high point will mean that they are seen as a focus. The scale of the visual effects will vary with atmospheric and lighting effects.

Nature and magnitude of visual effects:

As discussed, viewers will have a range of opinions as to whether the wind farm is a positive, neutral or adverse addition to the landscape. In my assessment the nature of the visual effects of the wind farm will be positive. I believe it will integrate acceptably in the working rural landscape context and will introduce an appropriate new feature of interest. Naturalness will be reduced but not significantly, given the modified rural character and because the turbines will be seen as a transparent layer with minimal effect on the landform, vegetation and agricultural land use. Three moderately scaled turbines will emphasise the summit of Porteous Hill but will not dominate the natural hill form. In my opinion the magnitude of the visual effects will be moderate from this area.

Residential viewpoints within 1.5km of the site

The following assessment of the closest residential viewpoints is made from the roads adjacent to the properties in question. Given that these are places of residence it is assumed that the viewers have a high degree of sensitivity to change in the views.

22 Pryde Road

Porteous Hill summit is to the south-east of the house at 22 Pryde Road with the closest turbine being approximately 550m from the house. The turbines are not within the sunny,

north facing aspect of the house and few of the windows appear to face toward the hilltop. The hill rises steeply behind the house and there is a significant elevation difference between the turbines and the house of approximately 150m. The simulation in the Lucas report 'across 22 Pryde Road' (viewpoint 2) is incorrectly labelled and shows the house at 90 Pryde Road.

From the house and its environs, turbines 1 and 3 will be entirely or largely screened by landform but turbine 2 will be prominent on the hill summit. Its vertical form, significant scale and dynamism will ensure that it is a focal point.

I understand that the residents at this property have submitted in opposition to the proposal and are therefore unlikely to view the wind farm positively. In my assessment, the visible turbines will be a major new element to the rural landscape at this proximity. Whilst they will not modify the landform or vegetation character they will modify the current level of naturalness and introduce a significant change to the landscape. Overall, it is my opinion that the magnitude of visual effects will be moderate – significant from this viewpoint. A higher rating is avoided because the windfarm is located 'behind' the dwelling and not within the main / north facing outlook and because there is substantial screening by landform.

90 Pryde Road

Porteous Hill summit is to the south of the house at 90 Pryde Road with the closest turbine being approximately 400m from the house. The turbines are not within the sunny, north facing aspect of the house and there is a substantial shelter belt around the southern side of the house. The hill rises steeply behind the house and there is a significant elevation difference between the turbines and the house of approximately 90m. The simulation in the Lucas report 'across 22 Pryde Road' (viewpoint 2) is incorrectly labelled and shows the house at 90 Pryde Road.

From the house and its environs, turbine 1 will be entirely screened by landform and turbines 2 and 3 are likely to be substantially screened by a combination of landform and

shelter planting. Within the wider setting however, the turbines will introduce major new built elements to the rural landscape and will be seen as focal points.

I understand that the residents at this property have submitted in opposition to the proposal and are therefore unlikely to view the wind farm positively. In my assessment, the visible turbines will be a major new element to the rural landscape at this proximity. Whilst they will not modify the landform or vegetation character they will modify the current level of naturalness and introduce a significant change to the landscape. It is my opinion that the magnitude of visual effects from this viewpoint (including the wider setting) will be moderate – significant from this viewpoint overall. A higher rating is avoided because the windfarm is located ‘behind’ the dwelling and not within the main / north facing outlook and because there is substantial screening by vegetation and landform.

139 Pryde Road

Porteous Hill summit is to the south of the house at 139 Pryde Road with the closest turbine being approximately 850m from the house. The windfarm is not within the sunny, north facing aspect of the house and there is a substantial shelter belt around the southern side of the house screening views toward the hilltop. There is a minor valley form between this house and Porteous Hill and the elevation difference between the house and windfarm site is approximately 90m. Simulation 2 in the Lucas report is a representation of the effects of the proposed turbines from Pryde Road near this house. In my assessment this is a fair representation of the scale and character of the proposed development except that the ZVI maps suggest that the top of the third turbine will also be visible to some extent.

Given the strength of the vegetative screening, it is unlikely that there will be any visual effects from the house at all but from areas surrounding, turbines 2 and 3 will be mostly visible and turbine 1, partially visible. Where visible, the turbines will introduce major new built elements to the rural landscape and will be seen as focal points.

I understand that the residents at this property have submitted in opposition to the proposal and are therefore unlikely to view the wind farm positively. In my assessment, the turbines will be a major new element to the rural landscape at this proximity. Whilst they will not modify the landform or vegetation character they will modify the current level of naturalness and introduce a significant change to the landscape. It is my opinion that the magnitude of visual effects from this viewpoint (including the wider setting) will be moderate – significant from this viewpoint overall. A higher rating is avoided because the windfarm is located 'behind' the dwelling and not within the main / north facing outlook and because there is substantial screening by vegetation and landform.

110 Porteous Road

Porteous Hill summit is to the north of the house at 110 Porteous Road with the closest turbine being approximately 650m from the house, and 50m higher in elevation. On the basis of site observation and the ZVI maps there is unlikely to be any visibility of the windfarm at all from this dwelling as there is significant landform screening. The ZVI map indicates that turbines could be seen from the wider area surrounding this house however site observation suggests that there will be effective screening by landform and vegetation.

I understand that the residents at this property have submitted in opposition to the proposal and are therefore unlikely to view the wind farm positively. However, in my assessment, the magnitude of visual effects from this viewpoint (including the wider setting) will be negligible or at worst, minor.

2333 Waikouaiti Waitati Road

The house at 2333 Waikouaiti Waitati Road is on the western side of the highway, approximately 1.35km from the nearest turbine and to the north-west of the site. Whilst the windfarm will be visible from the State Highway adjacent, shelter plantings appear to screen views from the south and the natural focus of views from the house, and the

sunny aspect is northward, away from Porteous Hill. Where visible in the wider area, visual effects will be as per those described for State Highway 1 within 3km of the site.

I understand that the residents at this property have submitted in opposition to the proposal and are therefore unlikely to view the wind farm positively. Overall, it is my assessment that the magnitude of visual effects from this property (including the wider setting) will be moderate. This rating takes into account the significant impact from the wider area but limited visibility from the house itself.

2197 Waikouaiti Waitati Road

The house at 2197 Waikouaiti Waitati Road is to the west of the site on the western side of the highway, approximately 1.05 km from the nearest turbine and 150m lower. There appear to be windows facing Porteous Hill, from which turbine 2 in particular would be prominent. Whilst the ZVI map indicates that all three turbines would be visible, turbines 1 and 3 would be partially screened by landform to varying degrees. Very little of turbine 1 in particular, would be visible. The turbines will be seen as a major new element on the eastern skyline from this viewpoint due to their significant scale, vertical form and moving rotors. This will reduce the naturalness of the hill but not significantly, given the modified rural character.

I understand that the residents at this address have made no submission and may or may not view the wind farm positively. It is my opinion that the magnitude of the visual effects from this viewpoint will be significant.

2142 and 2100 Waikouaiti Waitati Road

These houses are located in close proximity to each other on the eastern side of State Highway 1 approximately 1.2km from the nearest turbine and to the south-west of the proposed windfarm site. The ZVI map combined with field inspection indicate that there will be no visibility from this location due to landform and vegetation screening. The magnitude of visual effects is assessed as negligible at worst.

76 and 151 Stead Road

These houses are located to the south of the site, approximately 1.2km and 900m distant respectively. They are accessed via a private road and I have not visited them. They are located considerably lower than the proposed turbines and with steep hill faces intervening. The ZVI map (based on landform only) indicates that one turbine (turbine 1) may be visible but if so it would just be the top portion only. It is likely that intervening vegetation will ensure that any visual effects are screened

The residents at these addresses have made no submissions and may or may not view the proposed wind farm positively. In my assessment, the magnitude of visual effects from these houses will be negligible.

58 Reservoir Road

The house at 58 Reservoir Road is approximately 1.45km from the nearest turbine and some 260m lower to the south-east. The south-eastern slopes of Porteous Hill define the skyline to the north-west from this residence but the summit is not visible, and is screened by intervening landform and shelter belts. The ZVI map indicates that one or perhaps two of the turbines may be visible but if so it would be their rotor tips only. The map does not take vegetation into account and I believe that any visibility would be minimal.

The residents at this address have submitted in opposition and are unlikely to view the wind farm positively. In my assessment, the magnitude of visual effects from this viewpoint will be negligible – minor.

Visual effects of ancillary wind farm elements

The transmission line will not generally be visible from roads or residential viewpoints except for a short length of Porteous Road near State Highway 1. Given its light visual mass, short length above ground and the presence of the existing 33kV line, any adverse visual effects will be negligible.

Night time lighting will be shielded from viewpoints lower than the turbines and there will be no effects as viewed from the area surrounding. The lighting may be visible from distant viewpoints on the hills to the south of Blueskin Bay but would be seen in the context of the lights of Warrington and mitigated by the considerable distance. Any effects would be minor.

Effects associated with tree removal and upgrading of the access road for construction would be localized and have minimal impact on wider landscape values. Effects of earthworks and site structures during the construction phase will generally be screened from closer viewpoints surrounding by landform and vegetation. These will also be of short duration and overall adverse landscape and visual effects will be minor.

Statutory planning assessment

The statutory planning provisions considered most relevant to the landscape and visual effects of this application are outlined below, with brief comment as follows:

Dunedin City District Plan 2006 (Operative)

The site is in the Rural zone in the Dunedin City District Plan and partly overlain by the North Coast Coastal Landscape Preservation Area (although no turbines are proposed to be located in this area). The proposed development is assessed as being a Non-Complying Activity. The following Objectives, Policies and Assessment Matters are considered relevant.

Rural Section

Objective 6.2.2

Maintain and enhance the amenity values associated with the character of the rural area

Policy 6.3.5

Require rural subdivision and activities to be of a nature, scale, intensity and location consistent with maintaining the character of the rural area and to be undertaken in a manner that avoids, remedies or mitigates adverse effects on rural character. Elements of the rural character of the district include, but are not limited to:

- (a) A predominance of natural features over human made features,
- (b) High ratio of open space relative to the built environment,
- (c) Significant areas of vegetation in pasture, crops, forestry and indigenous vegetation,
- (d) presence of large numbers of farmed animals,
- (e) noises, smells and effects associated with the use of rural land for a wide range of agricultural, horticultural and forestry purposes,
- (f) low population densities relative to urban areas,
- (g) generally unsealed roads,
- (h) absence of urban infrastructure.

Policy 6.3.6

Avoid, remedy or mitigate the adverse effects of buildings, structures and vegetation on the amenity of adjoining properties.

Policy 6.3.11

Provide for the establishment of activities that are appropriate in the Rural Zone if their adverse effects can be avoided, remedied or mitigated.

Policy 6.3.12

Avoid or minimize conflict between differing land uses which may adversely affect rural amenity, the ability of rural land to be used for productive purposes, or the viability of productive rural activities.

Policy 6.3.14

Subdivision or land use activities should not occur where this may result in cumulative adverse effects in relation to:

- (a) amenity values

(b) rural character

(e) landscape management areas or Areas of Significant Conservation Values.

Irrespective of the ability of a site to mitigate adverse effects on the immediately surrounding environment.

Assessment matters

6.7.3 Amenity values

(i) The effect that the activity will have on amenity values

6.7.4 Cumulative Effect

The cumulative effect of the activity on the natural and physical resources of the City including, but not limited to, cumulative adverse effects in relation to:

(i) Amenity values

(ii) Rural character

(vi) Landscape Management Areas or Areas of Significant Conservation Values

6.7.9 Bulk and location

The bulk and location of buildings and their effect upon the amenity values of the site, adjoining sites, adjoining roads and the surrounding areas.

6.7.13 Visual impact

(i) The visual impact arising from an activity on the character of the rural landscape, visual amenity and significant views.

(ii) The potential effect of structures on significant views from public viewpoints, including visibility from State Highway 1.

(iii) The effect of an activity on the open amenity of the rural area

6.7.25 Landscape

The objectives, policies and assessment matters of the Landscape Section.

Comment

Wind farms are not incompatible with rural character per se, and indeed, require the space associated with larger scale settings such as rural landscapes. Naturalness of the landscape will be reduced through the introduction of large scale built elements but the extent of this will be limited in that there will be no significant change to the existing

landform, vegetation cover and rural land use. Essentially, the wind farm can be seen as an additional see through production layer in the rural landscape. Whether the visual effects of the wind farm are seen positively or negatively will depend on the individual viewer.

There are eleven dwellings within 1.5 km of the site. The closest of these are to the north, and the sunny aspect and natural focus of views from these properties is away from the proposed wind farm. For most of the other properties surrounding, there is either total or substantial screening by landform and / or vegetation. Overall, the number of nearby properties potentially subject to adverse visual effects is low.

It is my assessment that the scale, location and design of the proposed wind farm appropriately avoids and mitigates adverse landscape character and visual effects. This is because the earthworks required will not have significant effects on the natural landform or on-going visual impact, the scale of the wind farm as a whole and of the turbines themselves, is moderate and because the turbine design is sculptural and elegant.

There are no other wind farms or significantly scaled utility structures within the landscape context of the proposed site, with the exception of the television mast on Mt Cargill. Given this situation, it is my assessment that any cumulative effects of the proposed development on the impact of utility structures in the landscape, will be negligible.

Landscape Section

Objective 14.2.2

Ensure that the natural landscape characteristics of the coastal environment, wetlands, lakes, rivers and their margins are preserved and protected.

Objective 14.2.3

Ensure that land use and development do not adversely affect the quality of the landscape.

Objective 14.2.4

Encourage the maintenance and enhancement of the quality of Dunedin's landscape.

Policy 14.3.2

Identify and preserve the important characteristics that create the natural landscape character in the coastal environment, wetlands, lakes, rivers and their margins (as listed in part 14.5.2 of this section).

The relevant provisions outlined in 14.5.2 (a) (ii) are:

- The general visual dominance of the natural landscape elements, e.g. natural landform over human landscape elements, e.g. buildings or shelter plantings.
- The integrity, extent, coherence and natural character of the landform, streams and remaining areas of indigenous vegetation.
- The generally limited visual influence of any large scale structures or exotic plantings to diminish the impact of the natural landscape forms and features.
- The extent and quality of the dramatic coastal landforms and views. Visual interest is focused on the coastal edge.
- The remote wilderness character of the beach landscapes and the visual separation of these areas from adjacent developed areas by dunes or other landforms.
- The human-made features which are relics of the past, e.g. remnant shelter plantings.
- The highlights of transient wildlife interest, e.g. seals.
- Areas of significant habitat value, e.g. Aramoana Salt Marsh and Purakanui Estuary.

Policy 14.3.4

Encourage development which integrates with the character of the landscape and enhances landscape quality.

Assessment Matters

14.7.1 Visibility

The effects of the visibility of the proposed activity or development from the main public viewpoints.

14.7.2 Adverse Effects

The extent to which any adverse effects on the landscape can be avoided, remedied or mitigated.

14.7.3 Sympathetic Siting and Design

The extent to which the activity or development is sympathetic to the forms, character and scale of the landscape in its siting and design.

14.7.4 Landscape Features and Characteristics

The extent to which the activity or development impacts upon the important landscape features and characteristics to be protected, preserved or conserved (identified in part 14.5 of this section) within the relevant landscape management area.

14.7.5 Compatibility of Scale and Character

The extent to which the activity or development is compatible with its landscape setting in terms of its scale and character.

Comment

Porteous Hill defines the skyline and extent of the wider coastal landscape as viewed from many places in the area surrounding. The wind farm will introduce a significant new built element to the hilltop, thereby modifying natural character to an extent. In my assessment however, natural character effects will be minor because the turbines will contrast with, rather than intrinsically alter, natural elements in the landscape and because the landscape character of Porteous Hill is already significantly modified by rural land use. There will be no significant adverse effect on landform and no effect whatsoever on streams or remaining indigenous vegetation. Given the rural character and significant distance from the coast itself, I believe that the proposed wind farm will integrate acceptably with its setting.

Utilities Section

Objective 22.2.2

Ensure that any adverse environmental effects of the construction, operation and upgrading of utilities in the City are avoided, remedied or mitigated.

Assessment Matters

22.6.3 Amenity Values

The impact on amenity values resulting from the utility

22.6.4 Intensity

The size, scale and frequency of the utility in the environment and its effect on amenity values

Comment

As previously discussed, it is my opinion that overall, the proposed development acceptably avoids, remedies or mitigates adverse landscape and visual effects through its siting, scale and design.

Dunedin City District Plan 2015 (Proposed – 2GP)

The 2GP is still in its early stages and subject to challenge, and little weight can yet be given to it. The relevant objectives and policies however should be given some consideration. The proposed wind farm site is located in the Rural Coastal zone and overlain by the Seacliff Significant Natural Landscape (SNL) as well as a ridgeline notation. The coastal environment does not extend anywhere near the site. The proposed development would be considered a community scale energy generation activity and would have Non-Complying status given the location of the site within a Significant Natural Landscape.

Network utilities and energy generation section

Objective 5.2.1

Network utilities activities, including renewable energy generation activities, are able to operate efficiently and effectively, while minimising, as far as practicable, any adverse effects on the amenity and character of the zone; and where located in an overlay zone, schedules site, or mapped area, meeting the relevant objectives and policies for those areas.

Policy 5.2.1.5

Require network utility structures to be of a scale, size, design and location that enables the provision of network utilities while:

- (a) minimizing, as far as practicable, adverse effects on the amenity and character of the zone;

Policy 5.2.1.11

Only allowcommunity scale energy generation Where the activity is designed and located to avoid any significant adverse effects and minimize adverse effects as far as practicable, including:

- a. effects on visual amenity and the character of the zone in which the activity is located;
and
- b. effects on the amenity of any surrounding residential activities.

Comment

As already discussed, it is my assessment that the proposed wind farm will integrate acceptably with the character of its rural landscape setting and generally, without significant adverse effects on visual amenity values.

Natural Environment section

Objective 10.5.6

Outstanding Natural Features (ONF's), Outstanding Natural Landscapes (ONL's) and Significant Natural Landscapes (SNL's) are protected from inappropriate development and their values, as identified in Appendix A3, are maintained or enhanced.

Policy 10.2.5.15

Avoid wind generators – community scale In Significant Natural Landscape (SNL) and Outstanding Natural Landscape (ONL) overlay zones unless there are no material effects on the landscape values, as identified in Appendix A3.

Comment

The landscape values identified for the Seacliff SNL are grouped as natural science, cultural / historic, and aesthetic / amenity values and can be summarized as follows:

Natural science

- Natural landforms and the dominance of natural landforms and other natural elements over cultural landscape elements
- The contribution of rural amenity values to the natural character of the wider coastal environment.
- Areas of ecological significance including areas of indigenous vegetation.

Cultural / historic

- The presence of wahi tupuna of significance to manawhenua
- The scenic qualities of the landscape as experienced from Coast Road and the railway.
- The presence of sites of historic significance.

Aesthetic and amenity values

- The contribution of the area as the backdrop to or foreground of coastal views.
- Naturalness and aesthetic coherence values based on natural landform and the presence of native bush and scattered native and exotic trees.

The proposed wind farm will have no significant impact on the landform character of Porteous Hill. Whilst it introduces a significant new built element, it sits lightly on the land and will be seen as a transparent layer in the rural landscape. There will be no impacts on indigenous vegetation or rural land use. The submission of Kati Huirapa Runaka ki Puketeraki Inc confirms that there are no recorded Maori archaeological sites within the boundary of the proposed site (but requests that consent should be subject to an Accidental Discovery Protocol). I am unaware of any sites of historic significance that would be impacted. It is my assessment that the proposed development will have minimal impact on the quality of views from Coast Road or the railway. From these places, the focus of the view is overwhelmingly seaward. Where visible, the wind farm will be seen as part of the background rural landscape and may add an additional point

of interest, but one divorced from the coast itself. As far as its impact on the quality of the coastal backdrop is concerned, naturalness will be reduced slightly due to the introduction of three large structures, but the aesthetic coherence of the landscape will otherwise remain unchanged.

Rural Zones

Objective 16.2.3

The rural character values and amenity of the rural zones are maintained or enhanced, elements of which include:

A predominance of natural features over human made features;

A high ratio of open space, low levels of artificial light, and a low density of buildings and structures;

Buildings that are rural in nature, scale and design, such as barns and sheds;

A low density of residential activity, which is associated with rural activities;

A high proportion of land containing farmed animals, pasture, crops and forestry;

Significant areas of indigenous vegetation and habitats for indigenous fauna; and

Other elements described in the character descriptions of each rural zone located in Appendix A7.

Policy 16.2.3.1

Require buildings, structures and network utilities to be set back from boundaries and identified ridgelines, and of a height that maintains the rural character values and visual amenity of the rural zones.

Policy 16.2.3.9

Require activities to be designed and operated to ensure that adverse effects from light spill on rural character and amenity, and the ability of people to view the night sky, would be insignificant.

Comment

In my assessment, the proposed wind farm will maintain rural character and associated amenity values. Wind turbines are not structures that are unexpected in rural areas per se, and whilst the proposed turbines will modify the built / natural balance slightly, with just three, natural elements will still be strongly dominant. The turbines will be located on

a noted ridgeline but have been located in response to the wind resource and would be expected to be in prominent windy locations. The adverse effects of lighting will be effectively mitigated by shields to screen from lower viewpoints.

New Zealand Coastal Policy Statement 2010 (NZCPS)

Although the site is partially within the North Coast Coastal Landscape Preservation Area (NCCLPA) in the Operative Dunedin City District Plan, it is my opinion that (whilst it may be considered coastal hinterland) in terms of Policy 1 in the NZCPS, it is not within the coastal environment. The delineation of the coastal environment in the 2GP supports this view. I do not believe that the provisions of the NZCPS are relevant to this application.

Resource Management Act 1991 (RMA)

The RMA provisions considered relevant to the landscape and visual effects of this proposal are:

7. Other matters

In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall have particular regard to –

- (c) The maintenance and enhancement of amenity values
- (f) Maintenance and enhancement of the quality of the environment

As discussed above, it is my assessment that the proposed development is consistent with the maintenance and enhancement of amenity values and the quality of the environment.

Conclusion

Porteous Hill is not an outstanding natural feature, nor within an outstanding natural landscape. Although its eastern slopes are within the NCCLPA in the District Plan, the 'coastal environment' as identified in the 2GP is approximately 2km distant. The site is at the edge of an area identified as a 'significant natural landscape' in the 2GP. In my assessment its landscape and rural amenity values are based on a moderate – highly coherent natural landform, the presence of indigenous vegetation, its open, traditional pastoral farming character and the low impact of built elements. The hilltop is a visually sensitive location, forming the skyline from many areas surrounding and this is recognized by the 'ridgeline' notation in the 2GP.

The proposed development involves erecting three identical, three blade turbines on the broad summit of the hill, up to 102m, but more likely to be 80 – 85m in height. There are no other elements involved with the development that will have more than temporary potentially significant landscape or visual effects. Features of the proposal that will avoid or mitigate adverse landscape and visual effects include the modified rural character of the area, the ability to undertake the development without significant change to landforms, vegetation cover or rural land use, the modest scale of the wind farm as a whole and of the turbines themselves - which will not dominate Porteous Hill, and the sculptural, elegant character of the turbines.

Whether the wind farm is seen as a positive or negative addition to the landscape will depend on the individual viewer. In my opinion, it will contribute positively by enhancing memorability and will integrate readily with the working rural character of the landscape. The magnitude of the visual effects will vary with degree of screening and proximity to the site. In my assessment significant viewpoints from which there will be more than moderate impact are limited to an approximately 1km stretch of State Highway 1, north of Pryde Road, Pryde Road and the three houses located adjacent and the dwelling at 2197 Waikouaiti Waitati Road.

In terms of landscape and visual effects, it is my assessment that the proposal is consistent with the relevant statutory planning provisions.

Mike Moore

Registered NZILA Landscape Architect

Appendix A1: Zone of visual influence maps - method

Blue Skin Energy Limited ZTV—10Km Radius—Gamesa G58

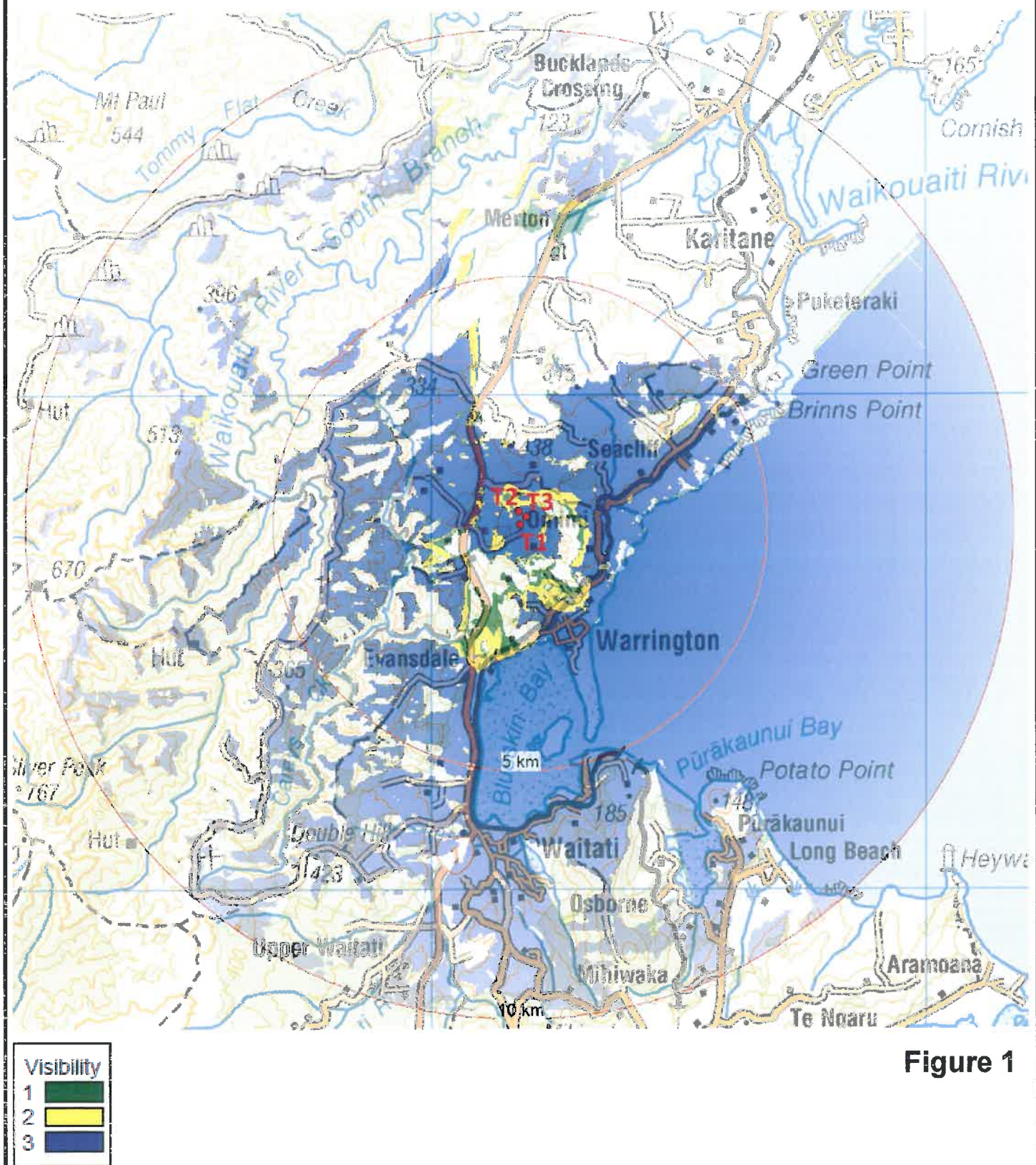


Figure 1

Blueskin Wind Farm

Figure Z02
Zone of Theoretical Visibility
Blueskin Wind Farm Site
Visibility Reference—Blade Tips (one per turbine)

Centre Grid Reference	1411800E 4937400N
ZTV Radius	10km
ZTV Resolution	25m
Number Of Turbines Visible	3
Hub Height	54m
Rotor Diameter	58m
Total Overall Height	83m

Prepared by:
Energy3 Services Limited



For:
Blueskin Energy Limited



Blue Skin Energy Limited ZTV—10Km Radius

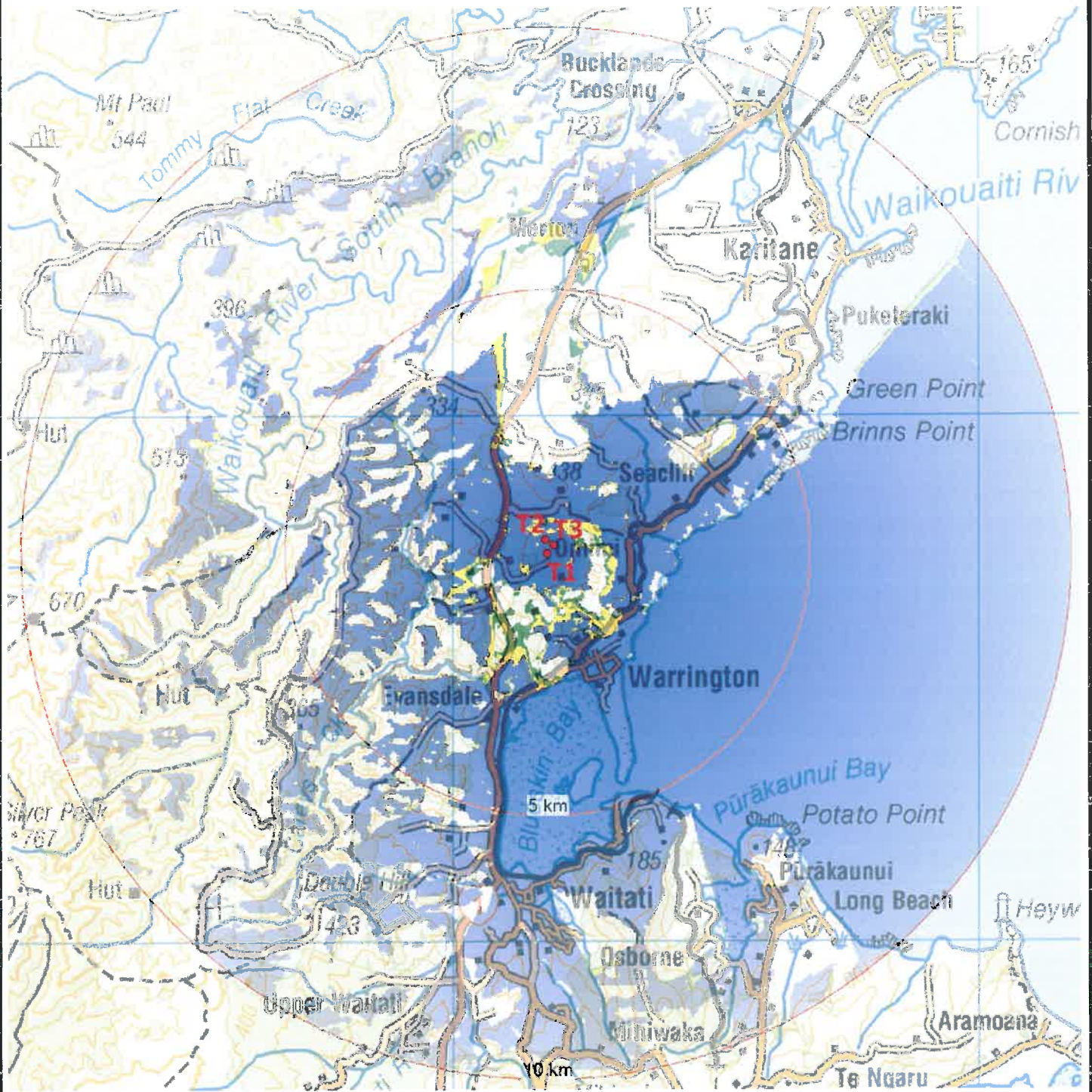


Figure 2

Blueskin Wind Farm

Figure Z01
Zone of Theoretical Visibility
Blueskin Wind Farm Site
Visibility Reference—Blade Tips (one per turbine)

Centre Grid Reference	1411800E 4937400N
ZTV Radius	10km
ZTV Resolution	25m
Number Of Turbines Visible	3
Hub Height	67m
Rotor Diameter	70m
Total Overall Height	102m

Prepared by:
Energy3 Services Limited



For:
Blueskin Energy Limited



Zone of Visual Influence Methodology

Zone of Visual Influence (ZVI) of the proposed Blueskin Bay Wind Farm were formulated using the WindFarm software (Release 4.1.2.2) written by ReSoft, a specialist wind farm software development company (<http://www.resoft.co.uk/English/>).

WindFarm is an integrated software package, which combines the ability to produce turbine site layouts, assess turbine energy yields, and also has the ability to analyse various turbine layouts for both noise emissions and visual impacts.

To accurately position turbine layouts and locations, topographical contour information is required. This data has been obtained through both the LINZ website, and directly from Dunedin City Council. The LINZ data provides background raster maps, and the Dunedin City Council data has a resolution of 10m. The data supplied by Dunedin City Council was of large enough scope to allow ZVI calculations. In conjunction a GPS surveyed layout of the proposed Blueskin Bay Turbine locations was also entered.

WindFarm uses the contour and layout information for a number of turbine energy yield calculations, and of particular importance, to perform the ZVI calculations and create the wireframe image for Photomontage formation if required.

A: ZVI Calculation

The ZVI module of WindFarm creates maps of the zone-of-visual-influence of a wind farm, and the cumulative visual impacts of a number of wind farms should there be more than one wind farm in the immediate area under study.

There are a number of different ways of counting visibility. The most common way is to count the number of turbines visible from certain points within a specified radius of the wind farm, with the point of visibility being the blade tip, nacelle, or a point on the tower. The blade points were counted in the case of the Blueskin Bay analysis.

In addition a visibility count can be made which sums each blade tip, nacelle, and a point on the tower that can be seen. Therefore if a whole turbine can be seen, the count for that turbine would be 3. The maximum count for a wind farm using this method is 3 times the number of turbines if no weighting is used for any particular component. This method does however have the disadvantage that a count of 6 could be either 6 blade tips or 2 whole turbines, which are visually very different.

The ZVI calculations use the loaded contour file, and the selected turbine dimensions to calculate where, and how many turbines can be seen from any particular vantage point. The accuracy of the ZVI calculation is highly dependent on the resolution of the contour data. With only 10m contour data available for the analysis area, the results will not be as accurate as using 2m contour data for the entire ZVI calculation area.

Various options are available to the software operator when conducting the ZVI analysis.

Important operator variables are:

- Topographical data
- Centre point of calculation area (usually notional wind farm centre)
- Calculation area
- Calculation shape (circular or square)
- Counting methodology (nacelle, blade, tower, or all components)
- Observer height relative to ground level
- Resolution of each visibility point
- Atmospheric refraction
- Earths curvature
- Inclusion of features which obscure visibility

It should be recognised that only the topography is normally used in a ZVI calculation (sometimes called a “bald earth” ZVI), ignoring the effects of trees, buildings or other structures, and therefore representing the theoretical maximum visibility of turbines that may be seen from a given point. However; WindFarm permits the specification of exclusion zones where features other than the landscape obscure the wind farm. For example, a forest area may be defined and given a nominal height of 20m. The turbines' visibility is automatically set to zero inside the exclusion zone and in addition the wind farm visibility will be modified at the edges of the forest because of its height. No exclusion zones have currently been entered into the ZVI analysis, however; exotic forests in the immediate vicinity of the proposed wind farm could be defined as exclusion zones, thus reducing overall visibility.

The graphical output of the ZVI analysis is a shaded circular or square region (depending on the calculation shape selection), with various colours identifying the number of visible turbine points from a particular vantage point. The output then has a topographical map of the area overlaid to give spatial context to the viewer.

The following screenshots illustrate the graphical ZVI output:

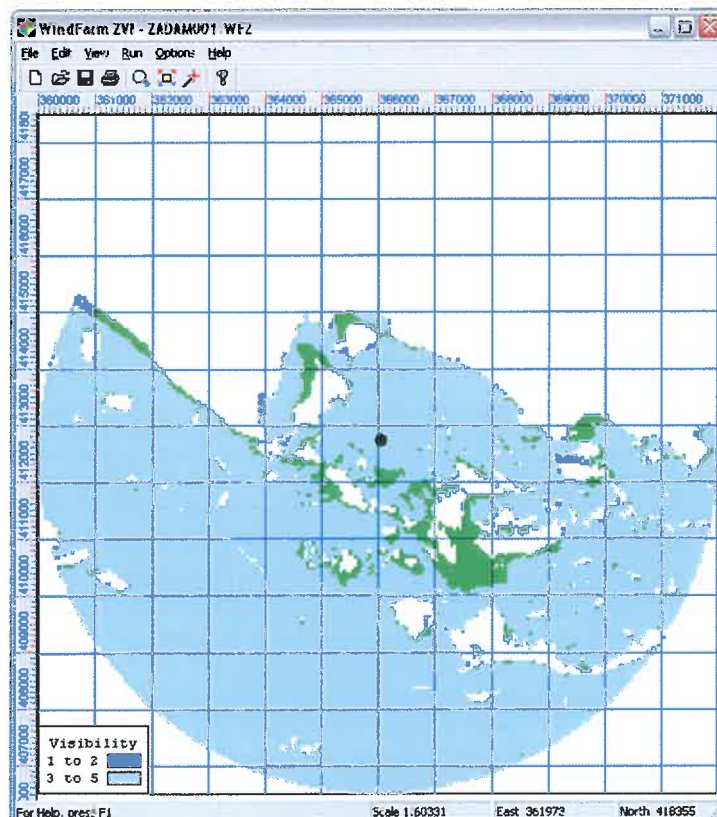


Figure 1 - ZVI Output

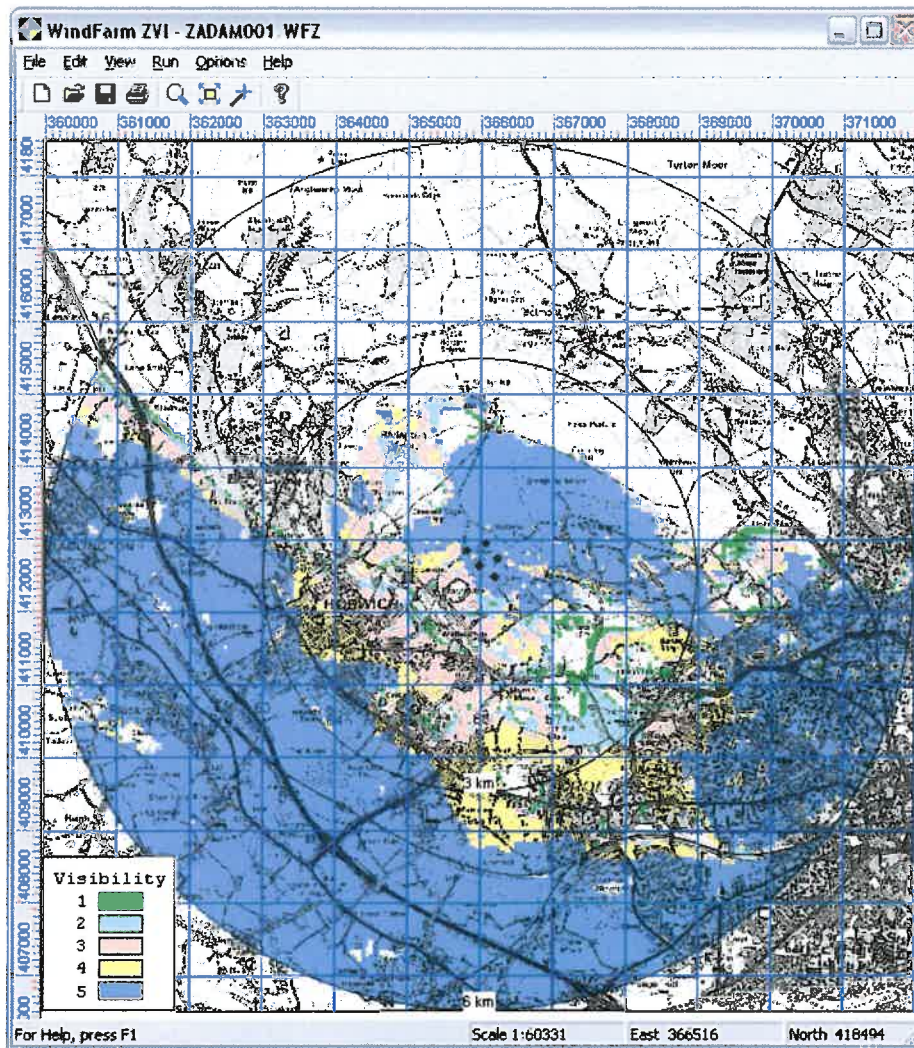


Figure 2 - ZVI output overlaying topographical map

Run Data and Statistics are available from each calculation run, and describe critical parameters of the run data, and also a list of visibility statistics. The number of visibility points, percentage of total points, and area is given for each of the groups. The information can be printed or exported as required.

B: Variances in Methodology to NZILA BPG 10.2

In August 2008 the New Zealand Institute of Landscape Architects hosted a Landscape Planning Initiative, from which arose a directive that a series of Best Practice Guide (BPG) documents be prepared. The Technical Guide for Photomontage Simulations was the first of such documents to be published, and as such, has relevance to the formation of the ZVI analysis and the photomontages for the proposed Blueskin Bay Wind Farm.

A key recommendation of the BPG is to use appropriate resolution topographical data. This does highlight a shortcoming of the analysis, as at this stage 10m contour data is only available. The ZVI calculation does however potentially suffer a loss of accuracy due to the lower resolution contours intervening between the potential viewer and the wind farm.

The analysis does however accurately follow the general principals set out in the NZILA BPG, namely:

- The analysis is as accurate as possible with the provided data, in order to assist in making well informed judgments. It is however noted that higher resolution topographical data would improve ZVI accuracy to some extent.
- The analysis by WindFarm is based on a structured and replicable procedure so that others may test and confirm the accuracy, and credibility of the simulations.
- The analysis is carried out by specialist wind farm software, and therefore uses techniques that represent the project in its true environmental context, and in a fair and reasonable manner.
- The presentation provides a clear representation, and conveys important information in regards to the analysis for each ZVI analysis.

Appendix C

Viewpoint 1 — Enercon E53

Recommended Viewing Distance 54.3cm (40.45 degree view angle) when printed A3 Landscape (40cm image width)

Blueskin Wind Farm

Figure 01

Photomontages from Viewpoint 1
Blueskin Energy Wind Farm Site

Grid Reference

5010910E

4934738N

2,897m

Distance to Nearest Turbine

Viewpoint Elevation

Number of Turbines Observed

Number of Turbines Visible

Notes:

Hub Height Option

Camera Lens

Camera Height

View Direction

Included Angle

Pitch Angle

60m

51mm

1.8m

336.31°

40-45°

8.10°

Prepared by:

Enercon Services Limited

For:

Blueskin Energy



Viewpoint 2 — Enercon E53

Recommended Viewing Distance 53.5cm (41.1 degree view angle) when printed A3 Landscape (40cm image width)



Blueskin Wind Farm

Figure 02
Photomontage from Viewpoint 2
Blueskin Energy Wind Farm Site

Grid Reference	1414577E
Distance To Nearest Turbine	493848.4N
Viewpoint Elevation	2.954m
Number of Turbines Option	99
Number Of Turbines Visible	3



Notes:
Hub Height Option
Camera Lens
Camera Height
View Direction
Included Angle
Pitch Angle

69m
51mm
1.8m
250.3°
41°
5.03°

Prepared by:
Energy 3 Services Limited

For:
Blueskin Energy



Viewpoint 4 — Enercon E53

Recommended Viewing Distance 52.1cm (42 degree view angle) when printed A3 Landscape (40cm image width)



Figure 04

Photomontages from Viewpoint 4

Blueskin Energy Wind Farm Site

Grid Reference

1411028E

4938280N

Distance to Nearest Turbine 971m

Viewpoint Elevation 193

Number of Turbines Option 3

Number of Turbines Visible 3

Notes:

Hub Height Option

Camera Lens

Camera Height

View Direction

Included Angle

Pitch Angle

Prepared by:

Energy3 Services Limited

For:

Blueskin Energy

Appendix D

Photo-simulation methodology

Zone of Visual Influence (ZVI) and photomontages of the proposed Blueskin Energy Wind Farm were formulated using the WindFarm software (Release 4.2.2.1) written by ReSoft, a specialist wind farm software development company (<http://www.resoft.co.uk/English/>).

WindFarm is an integrated software package, which combines the ability to produce turbine site layouts, assess turbine energy yields, and also has the ability to analyse various turbine layouts for both noise emissions and visual impacts.

To accurately position turbine layouts and locations, topographical contour information is required. This data has been provided by Blueskin Energy and its agents. The provided wider area data has a resolution of 10m, and the data provided in the immediate vicinity of the proposed wind farm has a resolution of 1m.

The GIS software package QGIS was used to read in the respective contour shapefiles for manipulation. The 1m contours relating to the top section of Porteous Hill were extracted and saved to a separate shape file. The two shapefiles were then merged, and the contour attributes coalesced to form one continuous shape file.

The resultant shape file was then loaded into WindFarm, in conjunction with GPS surveyed prospective turbine sites, the existing wind mast site, photographic viewpoints, and terrain markers.

WindFarm uses the contour and layout information for a number of turbine energy yield calculations, and of particular importance, to perform the ZVI calculations and create the wireframe image for Photomontage formation.

Photomontages

Photomontages of the proposed wind farm were created using the WindFarm software package as per the ZVI analysis. Minor image refinements were carried out using GIMP graphical design software (<http://www.gimp.org/>). Where necessary, multiple photographs are stitched together using Microsoft ICE to gain a wider field of view as appropriate. (<http://research.microsoft.com/en-us/um/redmond/groups/ivm/ice/>).

The basis of the photomontage creation is the loaded topographical data. This data is used to create a three dimensional wireframe model, on which its accuracy and resolution is based on that of the loaded topographical data. This is a combination of both 1m contours of the immediate proposed wind farm area, and 10m contours in the case of the data set used for the wider area. When the vector contour files are loaded into WindFarm, the data is converted into a specific grid file format to enable the wire frame rendering.

Turbine dimensions and attributes are entered into the WindFarm turbine studio module. The dimensions are accurately based on the turbine that is proposed to ensure the rendered turbines provide a realistic representation. Important dimensions and attributes include:

- Tower height, diameter, and taper
- Blade length, chord, taper, radius, pitch axis, and width
- Hub size and shape
- Nacelle size and shape
- Colour

The following screenshot provides an example of the parameters required for defining blade size in order to produce an accurate representation of the actual turbine proposed. Similar configuration screens are used to define the tower, hub, and nacelle dimensions.

Turbine Geometry

General | Tower | Blade | Hub | Nacelle

Default colour : Roughness : Number of blades :

☐ Anti-clockwise rotation

Hub A1 A2 A3 B1 B2 B3 C Tip

A1 radius (m)	1.5	A1 chord (m)	1.18	Details	☒ Use extra sections Section B1 does not have to be the maximum chord. Set C at or near to 90% radius. The maximum chord will be used with 90% chord to calculate the average chord for shadow flicker.
A2 radius (m)	2.33	A2 chord (m)	1.36	Details	
A3 radius (m)	3.16	A3 chord (m)	1.55	Details	
B1 radius (m)	4	B1 chord (m)	1.75	Details	
B2 radius (m)	9.71	B2 chord (m)	1.41	Details	
B3 radius (m)	15.43	B3 chord (m)	1.07	Details	
C radius (m)	21.15	C chord (m)	0.739	Details	
Tip radius (m)	23.5	Tip chord (m)	0.6	Details	

OK Cancel Help

Figure 1 - Blade size definition screenshot

Once the proposed wind farm layout has been entered via entry of the surveyed turbine locations, WindFarm then renders an outline of the turbines using the previously entered physical dimensions, and the three dimensional wireframe as the ground plane reference.

The following screenshot shows an example of a generated wireframe, and rendered turbine representations based on the desired turbine specifications.

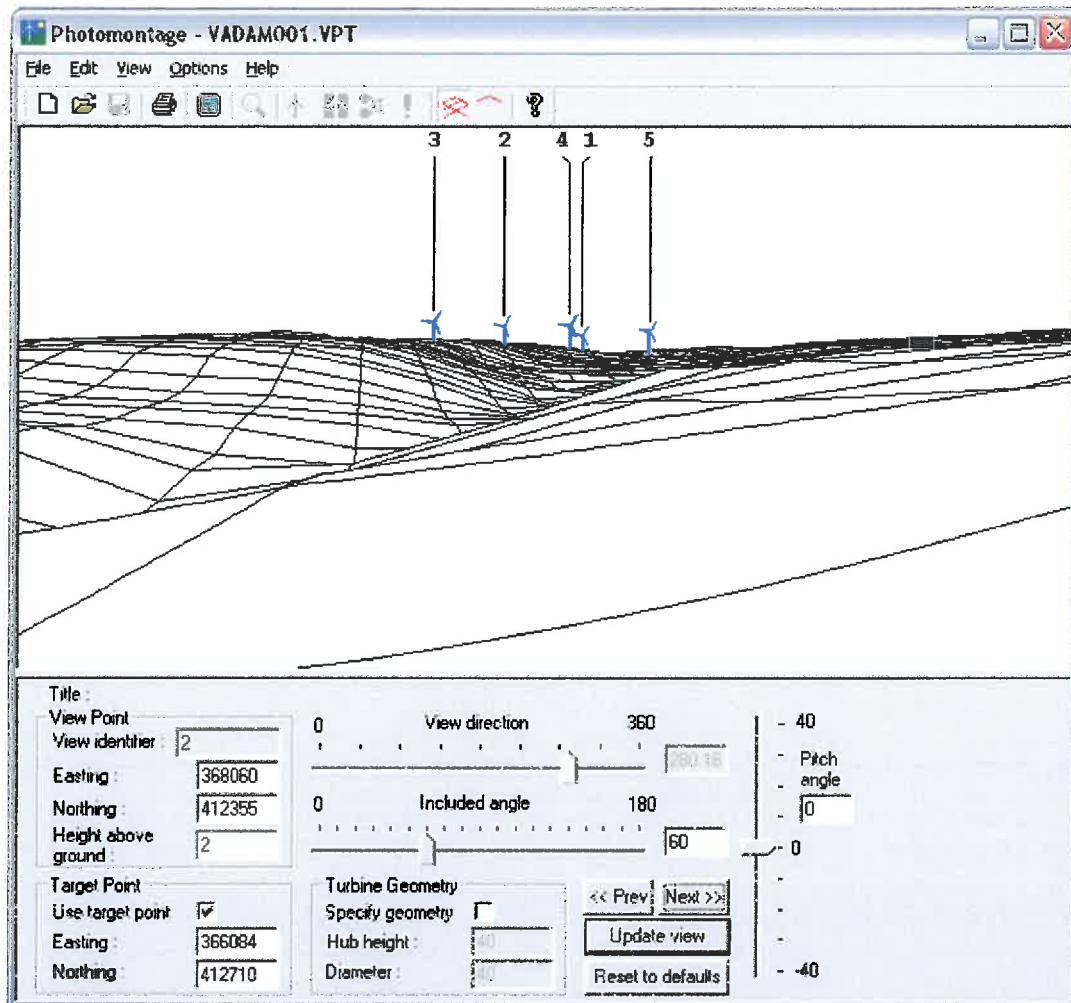


Figure 2 - Wire frame created from contour data

After the turbine rendering process has been completed, viewpoint coordinates must be specified for the photos that are to be used as the montage background. Once the viewpoints are specified, the WindFarm program is able to project a wireframe with scaled turbines, as if viewed from each of the defined viewpoints.

If a wider field of view is required than from a single photograph, a number of photos may be stitched together and then loaded into the photomontage module. No stitching was required for the Blueskin Energy viewpoints however. Microsoft ICE can be used for the stitching procedure. It is important to ensure however that the total field of view from multiple stitched photographs does not exceed 124° as this is greater than the primary human field of view.

The next step of the photomontage formation is to overlay the individual or stitched photographic image from a particular viewpoint with its corresponding wireframe view. During this process certain variables must be manipulated by the software operator to ensure the photo closely aligns to the wireframe with particular reference to the horizon.

Variables associated with the manipulation include:

- Height above ground from which the photo was taken
- View direction
- Included viewing angle
- View target coordinates (if required, or known)
- Pitch angle
- Photographic rotation
- Projection

In addition, geographic locators can be specified to accurately align the photographs with the three dimensional wireframe. These are firstly visually and physically identified on the actual wind farm site, and then referenced via a GPS coordinate in the wind farm layout. The markers are subsequently displayed in the wireframe model as a visible reference marker. When the relevant photograph is loaded into the WindFarm software module, the previously listed settings can be manipulated so that the wireframe markers line up with their respective referenced object on the photograph.

The following screenshot shows the process of using markers to align and position the photograph correctly, note that in this case, an existing wind monitoring mast was utilised as a visual marker on the left side of the shot:

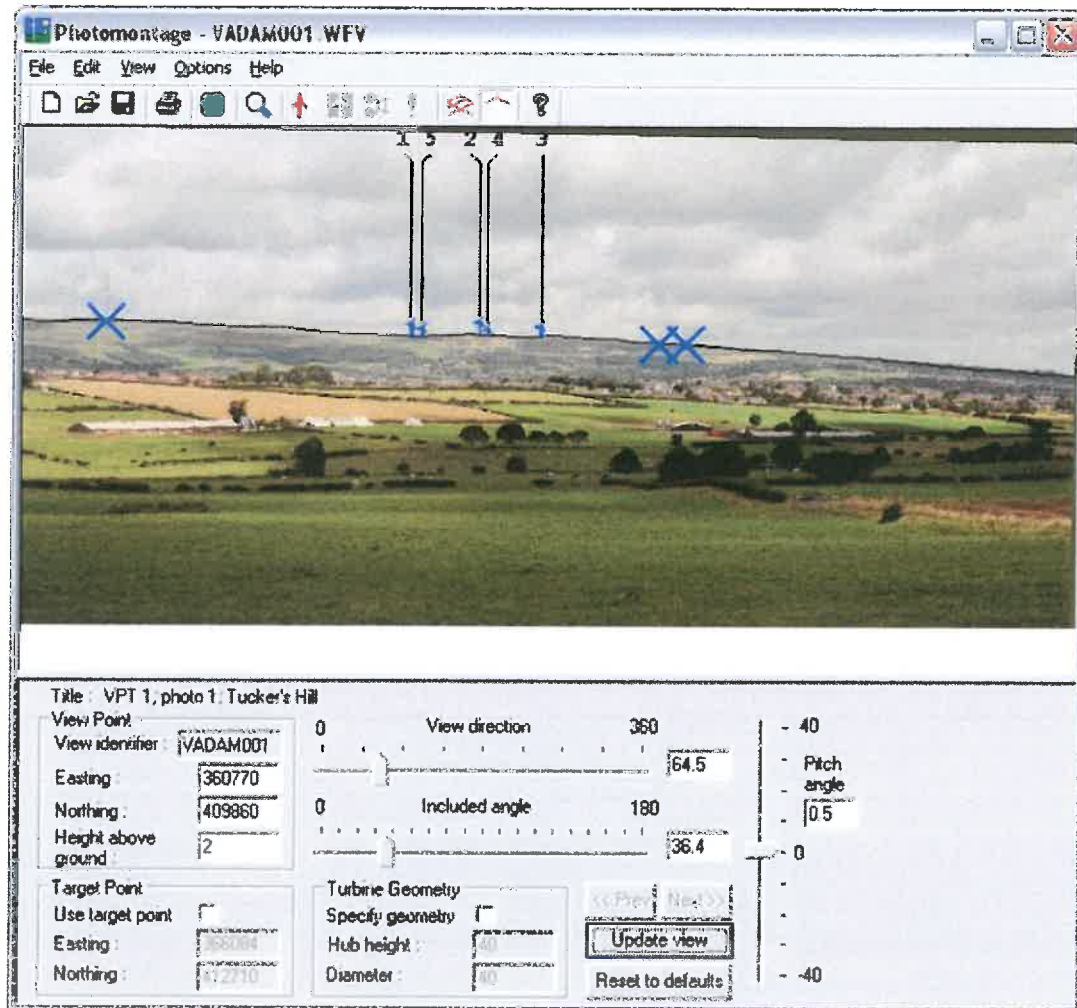


Figure 3- Photograph alignment with geographical markers

Following the correct placement of the photograph relative to the wire frame model, the turbines can be fully rendered to see how they fit in relation to the background photograph.

At this point of the process, the individual turbine positions relative to the photographs foreground are taken into account. For example, there may be trees in the foreground that should obscure some of the individual turbines structures. If this is the case, exclusion zones are digitized around foreground objects so that the rendered turbines will appear behind these objects, as opposed to the appearance of being in front of them.

The following screenshot shows the exclusion zone process:

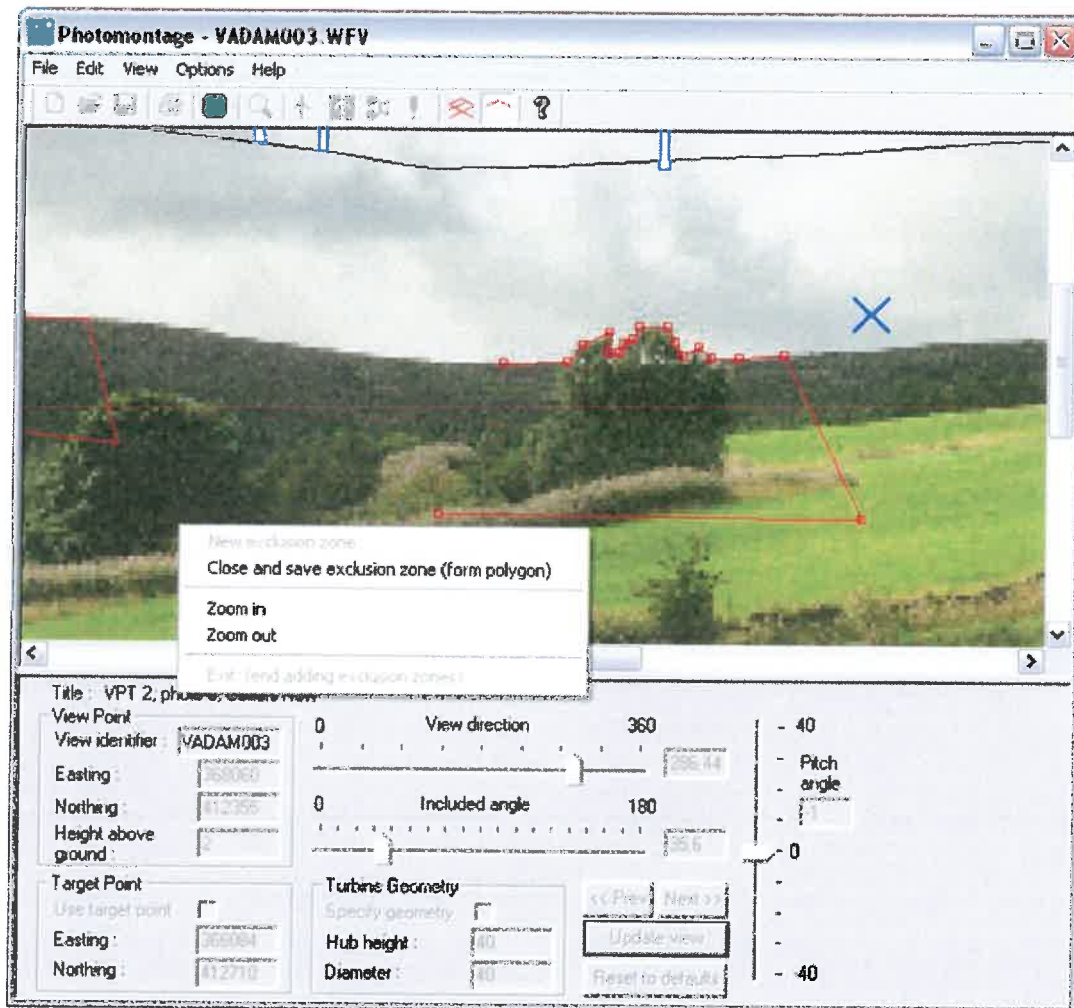


Figure 4 - Digitising exclusion zones

A number of other settings for the display of the turbines are also required to produce realistic simulations. These settings include:

- Lighting model
 - In this module the Sun's position is specified relative to the wind farm so that realistic shading is factored into the rendered turbines. The position of the turbine nacelles and blades relative to the viewer can also be manipulated depending on requirements.
 - Light intensity is able to be adjusted for the following scenarios:
 - Bright sunlight
 - Weak sunlight
 - Cloudy conditions with no sun
 - Custom control of conditions are also possible

- Colour Shift and Blur
 - The turbine colour is initially set via turbine specifications in the turbine studio module, however; colours may be manually adjusted to allow for a sunrise or sunset reddening effect.
 - Blur may be used when the distant horizon on a photograph appears slightly blurred. In this situation the rendered turbine will appear to be too sharp in relation to the photograph, and therefore may give a false appearance. Blur reduces the resolution of the rendered turbine giving a more realistic look in these situations.
- Earths Radius
 - The Earths radius is a preset value, but can be overridden if necessary.
 - Atmospheric refraction can also be included if necessary or desired.

The following screenshot shows a completed photomontage, prior to export:

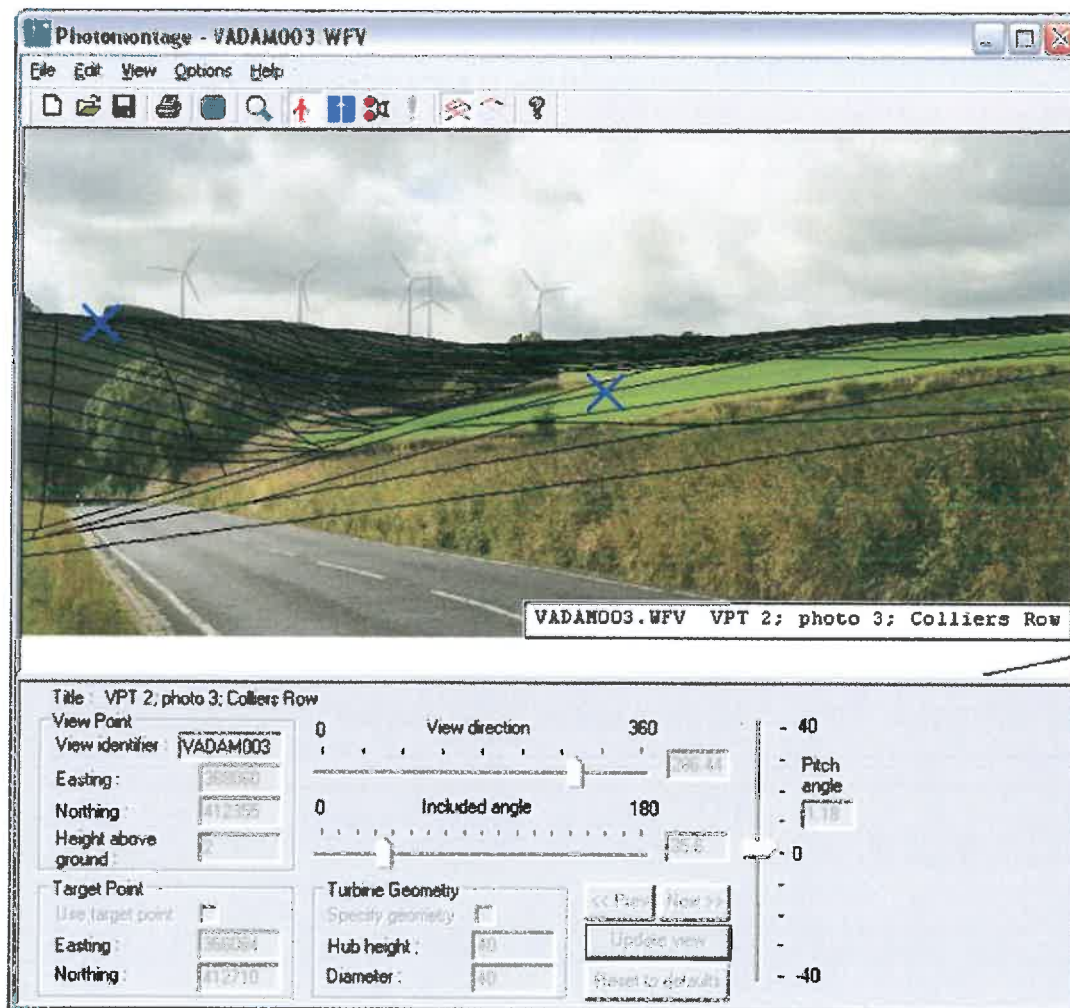


Figure 5 - Completed photomontage prior to export

On completion of the photomontage, the image is exported using the same resolution as the original photograph. When the image is exported, WindFarm calculates the correct viewing distance for a true representation.

Adjustments are sometimes required to be made to the exported photomontages to better reflect reality; for example where the turbine may be slightly above ground level due to topographical inaccuracies brought about by the resolution of topographical data, or when trees are in the foreground of turbines. These adjustments are performed with the GIMP software package, and are limited to refining the transition from ground/vegetation to tower structure.

The following screenshot shows such a situation where the left most turbines tower section intersects with trees, and to be realistic, the tower margins should be blended with the trees to some extent.

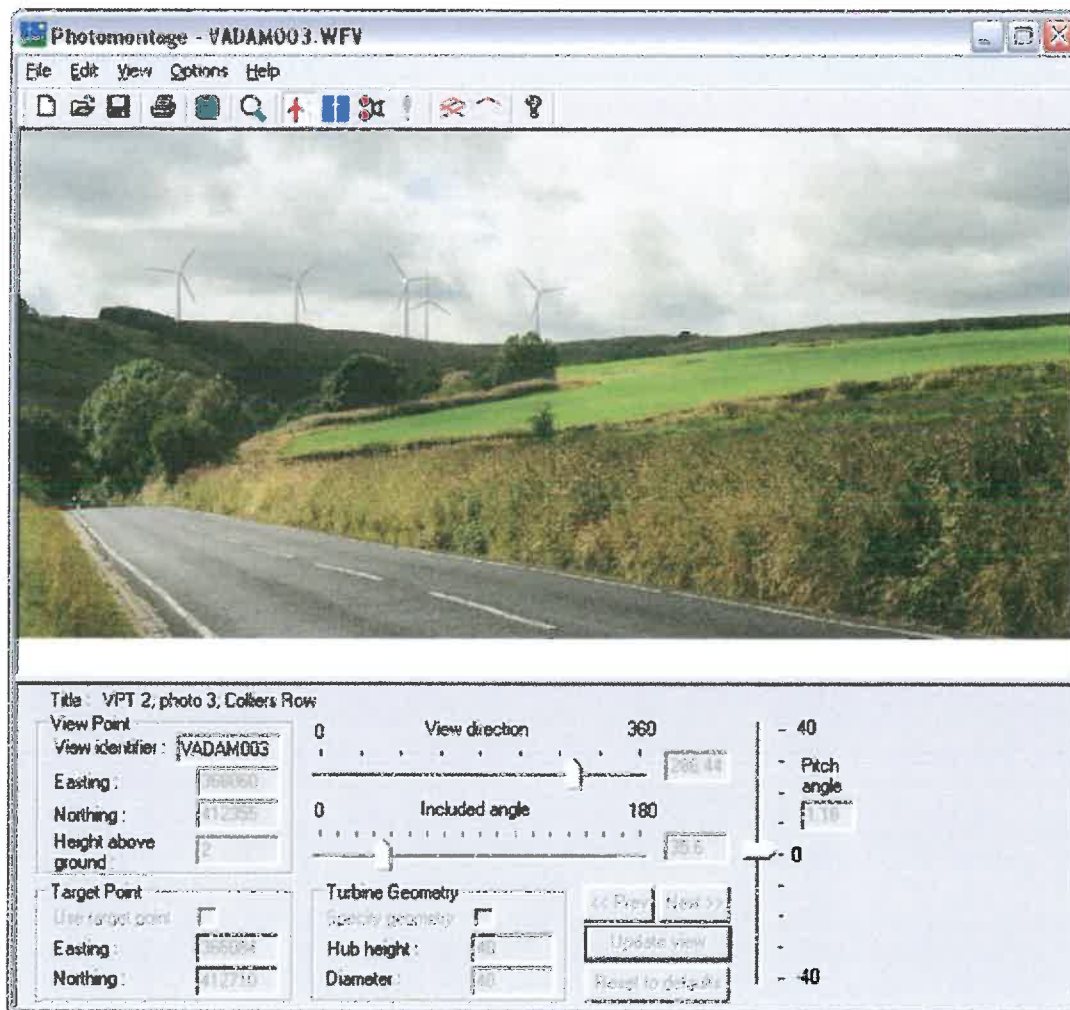


Figure 6 - GIMP editing required on left most turbines intersection with surrounding trees

Run Data is available from each photomontage file, and describes critical parameters of the photomontage process to enable auditing and verification.

C: Variances in Methodology to NZILA BPG 10.2

In August 2008 the New Zealand Institute of Landscape Architects hosted a Landscape Planning Initiative, from which arose a directive that a series of Best Practice Guide (BPG) documents be prepared. The Technical Guide for Photomontage Simulations was the first of such documents to be published, and as such, has relevance to the formation of the ZVI analysis and the photomontages for the proposed Blueskin Energy Wind Farm.

The analysis does accurately follow the general principals set out in the NZILA BPG, namely:

- The analysis is as accurate as possible with the provided data, in order to assist in making well informed judgments.
- The analysis by WindFarm is based on a structured and replicable procedure so that others may test and confirm the accuracy, and credibility of the simulations.
- The analysis is carried out by specialist wind farm software, and therefore uses techniques that represent the project in its true environmental context, and in a fair and reasonable manner.
- The presentation provides a clear representation, and conveys important information in regards to the analysis for each photomontage.

As part of the presentation process, it is however; important to ensure that large format printing is carefully managed so that the relationship between picture size and viewing distance is maintained. The prepared images are configured to be printed in the A3 format so that the printed image is 40cm wide, each photomontage has the appropriate viewing distance noted so as to attain the correct perspective. Often when displayed on a computer monitor, users will zoom in on the image, this distorts the viewed image resolution, and no longer reflects a true representation of the potential wind farm.