Kyoto energypark

Appendix B

Visual Assessment Study
Volume 1
Integral Landscape Architecture and Visual Planning
(Oct 2008)

pamada

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AUTHOR STATEMENT

This visual assessment report has been prepared by John van Pelt of Integral Landscape Architecture and Visual Planning. He has over 25 years experience in visual impact assessment of a wide range of infrastructure projects, including wind farms, transmission lines, telecommunication infrastructure road, rail and pipeline projects as well as numerous visual assessments of mining projects in the Upper Hunter River within the vicinity of Muswellbrook and Singleton.

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Signed

29th September 2008

Date

1.0 INTRODUCTION

1.1 General

Pamada Pty Ltd proposes to build an Energy Park that will contain 42 wind turbines in the vicinity of Scone in the Upper Hunter Valley of NSW, see figure 1.1. The Kyoto Energy Park will also include other clean energy generating and storing facilities as well as an education/interpretation centre.

The wind turbine component of the Energy Park is located on two landholdings, Middlebrook Station and Mountain Station. The wind turbines will only utilize a small part of each property and it is envisaged that all other land uses on the property and those adjoining will not be substantially impacted.

It is intended that the Mountain Station, the main wind turbine site will have 31 turbines and Middlebrook Station will have 11 wind turbines. The wind turbine component of the Kyoto Energy Park is generally referred to the wind farm component of the Proposal in this report.

1.2 Location

Mountain Station and Middlebrook, the wind turbine sites are approximately 12km to the west of Scone. The sites vary in character from open woodland to open forest and are obviously located in hill top locations.

Both wind turbine sites extend approximately 4km along their longest axis, with Mountain Station being set out in two north-south rows with one line of wind turbines on an east west ridge system while Middlebrook only has two turbines on an east-west ridge, with the remainder on a north south ridge. The sites are separated by some 5km and the alignment of the wind turbines generally run in a north-south direction.

1.3 Purpose of this Report.

The purpose of this report is to complete the visual assessment of the local, sub regional and regional landscapes of this Upper Hunter River Locality to ascertain the visual impacts of the proposed Energy Park in those setting.

The main focus of the visual assessment is the wind turbine component of the project. Other components of the project are smaller scale and more easily integrated into the landscape setting in which they are placed.

A methodology was established to assess the Visual Effects and Visual Sensitivity to the wind farm and hence to determine visual impact levels.

Consideration was also given to the visual qualities of the various landscape settings as a basis for considering the significance of the visual interaction between the wind turbines and the landscape.

Visual impact mitigation strategies are developed to decrease the visual effects and sensitivities through a range of visual and community based treatments to ameliorate visual impact experiences around the Kyoto Energy Park.

2.0 STUDY METHOD

2.1 General

The visual assessment of the Kyoto Energy Park Project has been completed in three ways. The first, determines visual impact using an assessment method that measures both Visual Effect and Sensitivity to determine the Visual Impact of the Project and develop strategies to mitigate those impacts.

The second was an evaluation which was completed in relation to landscape interactions and the effect of the proposal on regional, sub regional and local landscape values.

Thirdly to assist in the appreciation of the visual effects of the proposal and interactions with various landscape settings these will be illustrated with photomontage imagery from various locations.

The Visual Impact of the proposal was determined by assessing:

- Existing Visual Settings
- Viewing Locations
- Visual Character of the Development
- Statutory Framework

This information was then analysed to define:

- Visual Effect and
- Visual Sensitivity

In turn, these factors define Visual Impact, see Figure 2.1

When the two factors and their range of values are considered together, a range of Visual Impacts will result, usually defined as high, medium and low, Planning and Design Strategies are then implemented to reduce Visual Impact and achieve integration of the proposal into the landscape.

The level of residual impact following the implementation of mitigation measures is dependant on how Visual Effect or Sensitivity factors can be altered by such works.

2.2 Existing Visual Settings

Visual Settings

The area that is seen in any one view is a visual setting. These visual settings are constantly changing and include local, subregional and regional landscape settings. A local setting only contains foreground landscapes, e.g. an enclosed valley, a forest road, etc. A sub-regional setting contains landscape elements that are in the local setting close to the viewer and sub regional elements that are in the middle ground up to a distance of 10km away. A regional setting is one that has foreground/local, middle ground/subregional and background/regional landscape elements in the view.

The distances that define these view zones have been extended in relation to wind turbine elements due to the scale of these elements, see Figure 2.2.

The sites of the proposal are generally not seen in isolation, even from local viewing locations. Rather it would be a part of a total view that goes to make up the primary and secondary view zones of any viewing location. In this way the proposal especially the wind turbines would be seen in the contexts of broader landscape areas (visual setting) that adjoin the energy park sites and the viewing location as well as landscapes between these two locations. This is increasingly so as the viewing locations become more distant from the wind turbine sites

The Visual Settings are generally made up of more than one Landscape Unit.

Landscape Units

Landscape areas in visual setting that have similar landscape elements are usefully described as Landscape Units and are defined in and around the proposed sites

These Landscape Units contribute to the scenic makeup of the local, sub-regional and regional landscape settings of the proposal as it is seen from various view locations.

- the Proposal is part of a local landscape setting when it is closer than 2.5 km away from a viewing location.
- the Proposal is part of a sub regional landscape setting when it is between 2.5 & 10 km away from a viewing location.
- the regional landscape setting includes land further than 10 km away.

These distance zones are greater than are often used when assessing other development types, reflecting the increased scale and readability of wind turbine elements (see Figure 2.2).

Visual Quality of Landscape Units

The visual quality of the landscape is often defined as having high, moderate or low visual quality. It has also been defined as having distinctive, common or minimal visual values. Both of these classifications are based on a consideration of the visual diversity and interest created by land cover elements: land form, geology, vegetation, water features, land use elements, etc.

Often these values are considered separately or together to define the visual quality of a landscape, see figure 2.3.

Visual quality of a landscape unit has little influence on visual effect, nor does it of itself define the visual qualities of visual settings that include more than one landscape unit but it does give an indication of the distinctive landscapes in the locality and the relative values of the visual quality of the various landscape units.

The visual assessment of the existing landscape and its visual quality is discussed in Chapter 5 of this report.

2.3 Viewing Locations

An evaluation of land use maps, aerial photographs and field investigations illustrated the character of land use and the viewing locations and distance from the wind turbine sites. Land use around the sites includes rural residential and small lot rural lands, broad acre agricultural lands, recreation areas, conservation lands, major roads, minor roads and urban areas. These uses all have different visual expectations of the landscape, with some having a higher demand for visual amenity than others.

Distance of viewing location from the wind turbine sites would be important to Visual Effect. The closer a viewing area is, the larger the portion of the view as a whole and the Primary View Zone that will be occupied by the wind turbines and therefore the higher the visual effect. The converse being the further away the smaller and less significant the area of the view and the Primary View Zone is occupied by the wind turbines resulting in a lower visual effect.

Distance of a viewing location from the wind farm sites is also important to visual sensitivity. With an increase in distance to an undesirable development element it is likely that sensitivity to it will also decrease.

2.4 Visual Character of the Development

The wind turbines are the major visual component of the Kyoto Energy Park Proposal. Other components include wind monitoring towers, administration buildings, a visitor's and education centre, Maintenance sheds, substation, a transmission line and access tracks. All of these elements have a different visual character, reflecting their physical characteristics.

The wind turbine elements will be characterized through the visual expression factors of form, shape, line, pattern and colour. Most important of these would be line and pattern. Also highly significant would be the scale of development elements in relation to the existing landscape.

Further unlike many other developments, movement of blades and the resultant visual effects of visual attention and potential shadow flicker is a feature of this type of proposal.

The visual character of the development is discussed in Sections 4 and 6 of this report.

2.5 Statutory Framework

An important component of the existing environment is the statutory framework within which the existing landscape is managed. This planning context determines to a degree the visual character of various land use areas within the landscape.

The planning framework to which the wind farm component of the proposal must be responsive includes the Department of Planning Director General's requirements and the various land use zonings as defined in the Local Area Environmental Plan around the site that would reflect community expectations regarding visual outcomes of various land uses. This will include Amendment No 64 (Upper Hunter Local Environmental Plan 1986) that encourages the development of alternatives to fossil fuels.

In addition the method used in the visual assessment study is responsive to the guidelines set out in *"Wind Farms and Landscape Values – National Assessment Framework prepared by the Australian Wind Energy Association and Australian Council of National Trusts*

The visual assessment study defines the landscapes of the two wind farm sites in terms of distinctive, common and minimal visual quality and considers the visual interactions of the wind turbines with landscape settings as well as a determination of visual impact of the as defined by the stated methodology.

The statutory framework for the Kyoto Energy Park is discussed in Section 3 of this report.

2.6 Visual Effect

General

The Visual Effect of the Wind turbines is a measure of the degree of contrast and visual integration it has with the existing visual setting of the landscape. Generally due to the scale of wind turbine elements, their elevated position in the landscape, generally on a skyline, and the strong contrast between wind turbine elements and existing visual expression elements of the landscape (especially in relation to line), visual integration will be weak and contrast high.

A number of factors influence the Visual Effect of the Wind turbines. These include:

- Visibility and distance of a viewing area from the sites
- Scale of wind turbines;
- Visual expression factors of wind farm elements;
- Components of landscape contributing to any view of the wind turbine sites and
- Components of landscape affected by wind turbines;

In the first instance the wind turbines have to be seen to have a Visual Effect. If it is not part of a view then it has no Visual Effect and therefore no Visual Impact on that viewing point.

Visibility

The visibility of various parts of the wind farm from various locations depends on topography, intervening vegetation and or other elements.

- Topography:

The wind turbines will not be seen if there are topographic features that break the line of sight between the elements and the viewing location. Negating any views to the they may have will also negate any Visual Effect. Zones of Visual Influence Maps included in Section 6, Figure 6.1 reflect this value.

- Foreground Screens:

If topography is not a screening influence, it would be still possible for the wind turbines to be hidden from view. This occurs when foreground element such as vegetation in rural areas and vegetation and or built elements in town obstruct views to the wind turbine site.

This foreground screening effect can occur around any viewing location, be it a house, road, walking track, or broader areas such as rural fields. These screening influences are not taken into account in the determination of zones of visual influence.

Scale
Scale refers to the relative size of an object or development. The larger the scale relative to its visual setting the higher the visual effect is likely to be. In this context, the wind turbines would be seen as having very large scale compared to other built elements in the landscape.

Visual expression factors of wind turbine elements
Any object is expressed visually through its form, shape, line, colour and pattern. These features are known as visual expression elements.

Often one or some of these factors are dominant over others due to their visual strength. In the case of wind turbines, the line created by the towers would be a dominant visual expression factor, as would be the linear pattern created by numerous wind turbines and the rotating blades.

Components of landscape contributing to any view of the wind turbines
The wind turbines would be never seen in isolation. Rather they would be seen in an infinite number of visual settings that may include foreground, middle ground and background landscape components. These components, especially foreground components, especially close to a viewer location, provide opportunities to create visual integration by virtue of scale and line as well as providing filtering and or screening elements.

Component of landscape affected by wind turbines
Although the wind turbines would be large, its direct visual effect would be generally limited to the 'skyscape' component of a given view. The 'landscape' component would be for the greater part not visually affected, except in the totality of the view. This has implications for how to visually integrate or screen the wind turbines from critical view points.

2.7 Defining Visual Effect.

Contrast and Visual Integration
The Visual Effect of a development will depend on the degree of visual contrast and integration it has with a visual setting, see Figure 2.4. The higher the contrast and lower the visual integration the higher the Visual Effect. Conversely, the lower the contrast and or higher the visual integration, the lower the Visual Effect.

Primary Viewing Zone
The area we see generally consists of a Primary View Zone that is flanked by the peripheral or secondary view zone. The Primary View Zone is the most important. It is conservatively defined for the purposes of this study as the area of a semi-circle superintended by an angle of 30 degrees as illustrated in Figure 2.5. The size of this Primary View Zone increases as one views more distant landscapes. For example at 1km away from the viewer the Primary View Zone occupies an area of 0.69km^2 at 3km the Primary View Zone occupies 4.71 km^2.

The Visual Effect of a development is based on contrast and integration levels and the amount of the Primary View Zone that is occupied by it. Obviously for a given level of contrast and integration the smaller the proportion of an element in a total view, the lower will be its Visual Effect on that view.

Visual Effect Levels

The Visual Effect levels have been defined in terms of contrast and visual integration levels (Figure 2.4)

For high contrast and low integration developments such as a wind farms, the following Visual Effect levels apply:

- *A High Visual Effect* will result if the wind turbines occupy a portion of the Primary View Zone being greater than 5%.
- *A moderate Visual Effect* will result if the wind turbines occupy 2.5 - 5% of the Primary View Zone,
- *A low Visual Effect* will result if the wind turbines affects 1 - 2.5% of the Primary View Zone. and
- *A very low Visual Effect* will result if the wind turbines affects less than 1% of the Primary View Zone.

While the determination of these levels is somewhat arbitrary, it is based on the premise that strong contrast and low visual integration development elements need only occupy a small area of the Primary View Zone to create a high overall Visual Effect.

In the use of the 5%, 2.5% and 1% levels, it should be noted that the areas so affected are calculated on the basis of the very worst case scenario with the affected area representing a solid rectangle of affected space that is determined by the height of the turbines and the total width of the wind turbines and not tall but slender elements spaced intermittently along a ridge line.

Illustration of Visual Effect with Photomontage

Photomontage images of the wind turbines in the landscape were prepared for a range of viewing zones around the wind farm sites.

The method of creating these montage images was based on best practice techniques where computer models are inserted into photographs taken from various sites. Various camera focal lengths were used to enable the wide angle of the wind farm sites to be captured. This focal length of the photography was used to determine the focal length of the computer camera to generate the computer model of the terrain and wind turbine elements. The images were then enlarged onto an A3 sheet to simulate real life magnification viewed from the naked eye. It is important that the photomontage images within this report, reproducing these images at larger scales would create unrealistic images of what is seen from a particular location.

The visual effect of the development components of the Kyoto Energy Park including the photomontage are discussed in Section 6 of this report.

2.8 Visual Sensitivity

Contributing Factors

Visual Sensitivity is used to define how critical a change to the landscape will be perceived by those viewing the landscape. Obviously any given landscape area is potentially viewed from an infinite number of view locations by any number of people.

A key factor in visual sensitivity is perception. There is a wide range of perceptions about the visual character of. Research seems to indicate that the general community do not have an

adverse opinion on wind farms. However it is also true that when local communities are affected the perception of the wind farms are in some cases less positive.

It is therefore necessary to use objective criteria to determine sensitivity. In this study high sensitivity will relate to activities that use the landscape as part of that land use designation. In this way residential and recreational land uses have a high sensitivity because they use the scenic amenity of the landscape. Impacting on scenic amenity values of these land use types has an effect on the enjoyment of these land uses.

On the other hand for example, the visual amenity of the landscape does not influence industrial or rural land use activities. In a similar way travel routes and other land uses have different levels of sensitivity; reflecting that land use's need for visual amenity to function. In this context a tourist route will be more sensitive than other roads.

Although a final measure of sensitivity is down to individuals and their perceptions, in general it is considered appropriate to consider the following parameters:

Visibility
Visibility is a factor for both Visual Effect and Sensitivity. The wind turbines has to be seen to have a Visual Effect on a location. Similarly it has to be seen to create a sensitivity response from a viewer. Something that is not seen will not induce a visually sensitive response to it. Something that is clearly seen may generate a strong response. In this way a view from a house differs from a view from a highway.

Visibility is also affected by a wide range of climatic and diurnal factors, such as cloud cover, front and back light as well as time of day. These variations are infinite and constant and while they should be born in mind, they have not been used in determining visibility factors

Duration of Viewing
In much the same way as visibility, the longer one sees an element the stronger the response to it may be. For example if an undesirable development is only seen for a short time, it will be viewed less critically than if the same development is seen for a long period of time.

View Orientation
Although, it is not possible to assess the significance of a view on a house by house basis, such considerations are important. A view from a lounge room is more significant than a view from a laundry. In the same way a view from an outdoor entertainment area is more significant than a view from the garden shed or cloths drying area, see figure 2.7. In this way views from a house can be considered as being of primary, secondary or tertiary significance that will affect sensitivity levels.

Land Use Activity
The land use activities that use the views as a functional part of the activity, e.g. residential and recreational are said to have a high Visual Sensitivity while those that do not such as broad acre farming areas are considered to have a lower Visual Sensitivity. Others that use the view as an adjunct, rather than a functional part, will have a moderate sensitivity.

Distance
The further away the wind farm, the less sensitive a viewer will be to visual changes in the landscape due to reduced scale and visibility.

Viewer Perception
This is perhaps the most important, but most complex factor affecting Visual Sensitivity. Viewer perceptions are infinitely variable and can even vary within the same person viewing the same development.

Perceptions are dependant on many variables including personal preferences, education, interests, etc. For example an engineer may view an infrastructure development differently to an architect and both views may differ from that of a resident, whose own views may alter depending on where the development is.

With specific reference to a wind farm, it is possible that a person travelling well away from home will respond differently to a wind farm viewed as part of a journey to the same type of element being viewed from their own home.

Summary of Visual Factors

The above factors are the major contributors to viewer sensitivity, however they are numerous and almost infinitely variable. For the purpose of assessment, it is therefore necessary to simplify the factors considered. Visual Sensitivity will be considered in terms of Land Use, which gives a good indication of the importance of views, and distance, which affects scale and visibility. Both factors can be readily mapped.

Land Use
As outlined in the definitions, land uses that use views as a functional component of the land use will result in the highest sensitivity levels. Those land uses that do not use visual amenity as part of the land use have low sensitivity. Others have a moderate sensitivity.

Hence rural and urban residential dwellings as well as lands along with recreational lands, tourist areas and designated tourist roads that use visual amenity as part of the land use experience have a high Visual Sensitivity to change.

Non tourist roads, minor streets and non designated main roads have a moderate sensitivity.

Work areas; be they rural or urban, and active recreation areas have a low sensitivity.

In relation to views from residential properties it is also important to see how a view is utilised. Is it part of the primary view from a lounge room, family room, etc, creating high sensitivity. Is it a view from a secondary use area such as a bedroom creating a lower sensitivity or is it a view from a utility area or room creating the lowest sensitivity, see figure 2.7.

It would also be evident from inspection of a property to see the significance placed on a view that has a potential view that contains the wind turbines. This is discussed further in Section 7 of this report.

Distance
In addition to influencing Visual Effect, distance is also important in relation to Visual Sensitivity. Obviously the closer a viewing area is to the proposed wind turbines, the greater the potential Visual Effect, increasing sensitivity to this change in the landscape. Seeing any given number of wind turbines from, say, 2km away is obviously going to create a greater sensitivity than if it is seen from 10km away from a similar land use type.

Although distance limits for various sensitivity levels, as for visual effect levels can create some anomalies at the edges, these should be handled when impacts are determined and mitigation strategies implemented. An example of such an anomaly is that of a house at the limits of 7.5km will be recorded as having a high sensitivity a house just outside and only 100m away will be given a moderate sensitivity. As stated above such situations need to be considered giving regard to view orientation and real significance of a view to a particular house.

Visual Sensitivity levels based on a consideration of land use and distance are outlined in Figure 2.6.

Visual Sensitivity to the Kyoto Energy Park is discussed in Section 7 of this report.

2.9 Visual Impact

Visual Impact is the final measure of the environmental impact of the wind turbines in relation to visual values. Visual Impact is dependant on two sets of factors, Visual Effect and Visual Sensitivity, see Figure 2.8. The wind turbines will always have a Visual Effect, however if it is not seen from a particular situation, there will be no Visual Impact on that locality.

Visual Impact of the Kyoto Energy Park on the various visual settings and landscape that surround the sites of the wind turbine component of the park is discussed in Section 8 of this report.

2.10 Treatments

Effective visual treatments to reduce Visual Impacts are generally limited to the foreground of viewing locations. In these situations landscape treatments can be carried out to filter views to the wind farm elements while maintaining views to the far greater part of the landscape that is part of a view.

There is relatively little that can be done to increase visual integration of wind turbine elements at the wind farm site itself. This is due to the scale of wind turbines and their skyline location . Some visual impact mitigation strategies could include:

- Passive non-reflective matt finish
- Maximise turbine spacing to reduce cluttering effect.
- Larger turbines optimise power output to revolutions of the blades (rpm). As well as reducing noise propagation the slower blades reduce movement and the visual effect flowing from it.
- Turbines also rotate at consistent rpm to improve visual aesthetics at greater distances.
- Turbine control procedures allow turbines to spin freely below cut-in speeds to maintain visual consistency across all turbines.

Painting in skyline situations has little effect in contrast reduction and achieving higher levels of integration with the landscape. Painting can be used to change the visual effect or to make a statement in the situations that this may be warranted but it does little to reduce visual effect levels.

Treatments at various viewer locations are intended to screen or decrease visibility by increasing visual integration and decreasing contrast by providing foreground 'framing' elements through which wind turbine elements are seen.

This is generally done with tree plantings. Such plantings are strategically done to maintain views to various sectors of the landscape while filtering views to wind turbine elements.

This type of treatment is only recommended for those residences that are closest to the wind farm sites and are impacted by major Visual Effects. The treatment range here can include compensatory landscape treatments and view re-orientation as appropriate.

3.0 PLANNING CONTEXT

The Planning Context for the Kyoto Energy Park Proposal in relation to visual considerations is created by a number of planning instruments as well as the Director General, Department of Planning NSW requirements.

These include:

- Director Generals Requirements
- Major Projects SEPP
- Scone Local Environmental Plan (LEP) 1986
- Amendment to Scone LEP
- Upper Hunter Land Use Strategy
- Wind Farms and Landscape Values – National Assessment Framework.

3.1 Director General Requirements.

In the first instance assessment must be completed in the context of the NSW Wind Energy Draft Environmental Impact Assessment Guidelines 2002.

Within Key Assessment Requirements the following impacts were identified;

Heritage

"The assessment must identify indigenous, non indigenous, cultural, archaeological and built heritage issues/items, the potential impacts activities associates with the project will have on these and mitigation measures."

Although this assessment requirement does not specifically refer to heritage landscapes, consideration will be given to the visual impacts of the proposal on Castle Rock which is a landscape feature identified in Schedule 3 of the Scone LEP 1986. Other rock features are located nearby and have been included in this assessment.

Visual Amenity Impact

In relation to visual amenity impacts, the Director General's requirements sought that:

"The Environmental Assessment must fully describe all project components, locations and dimensions including wind turbines solar PV array, visitor centre, transmission lines, substations, etc.

A photographic assessment clearly demonstrating the potential visual amenity impacts of the proposal must be provided along with clear description of visual amenity mitigation and of the feasibility, effectiveness and reliability of proposed measures that the Proponent intends to apply to the project. An assessment of the feasibility, effectiveness and reliability of proposed measures and any residual impacts after these measures have been implemented must be included in this regard with a zone of visual influence map provided covering the towns of Scone and Aberdeen.

The Environmental Assessment must specifically address the following matters with respect to individual project components.

Solar PV Array – the Environmental Assessment should provide an analysis of reflectivity on surrounding residents;

Visitor Centre – the Environmental Assessment should identify that the height, scale and lighting of the building responds and contributes to its context and that the design has an appropriate scale of built form (including roof and building height)

Transmission Line/Grid Connection. – The Environmental Assessment must describe the proposed corridors, likely route alignments and location of energy storage devises, proximity to other infrastructure and urban and rural residential development.

Wind Turbines – The Environmental Assessment must assess the visual impact of the proposal on this landscape (including existing and approved dwellings) for a distance of at least 10 km from the turbines, taking into consideration the impact of shadow flicker and blade glint. The visual impact assessment should be prepared with regard to the Australian Wind Energy Association and Australian Council of National Trusts Wind Farms and Landscape Values: Stage 1 Final Report Identifying Issues March 2005 Appendix B: Wind Farms and Landscape Values Final Issues Paper."

3.2 Major Projects – SEPP framework

The Kyoto Energy Park is a development of a kind that is described in Schedule 1, Group 8 of the SEPP, and is, therefore, a project to which Part 3A of the *Environmental Planning and Assessment Act 1979* applies. Those elements will have a capital investment value in excess of $30 million.

3.3 Scone Local Environmental Plan 1986

Zoning

The sites for the wind turbines on Middlebrook is within a 1(d), 1(i), 1(s), and 7(a) zoning, while the Mountain Station site is within the 1(d) and 1 (s) rural zoning, see figure 3.1.

For this assessment the zoning of relevance is Zone 7(a) Environment Protection – Scenic Zone.

The LEP requirements for the "Zone No 7 (a) (Environment Protection "A"—Scenic Zone)

1 Objectives of zone

To protect hill land, escarpments and river valleys of scenic significance and permit a variety of uses subject to more particular control as, for example, in the choice of building materials, position of a building site, access roads and landscaping.

2 Without development consent

Home occupations.

3 Only with development consent

Agriculture; dams; animal boarding, breeding or training establishments; drainage; dwelling-houses; eco-generating works; forestry; home industries; hospitals; underground mines; open space; picnic grounds; places of public worship; recreation establishments; retail plant nurseries; roads; roadside stalls; tourist facilities; utility installations.

4 Prohibited

Any purpose other than those included in item 2 or 3.

Note: Part 3A of the *Environmental Planning and Assessment Act 1979* identifies matters for which the proponent will investigate items of environmental significance, referred to as the Director General's Requirements. Part 3A technically sets aside consideration of the local LEP and such controls, however consideration to the requirements of the Scone LEP has been undertaken.

3.4 Special Provisions of the Local Environment Plan

Within Division 9 General of the LEP a consideration of landscapes are outlines

"39 Landscapes

In determining the impact of a proposed development on the landscape quality of an area marked with black diagonal hatching on Sheet 1 of the map, the Council may have regard to the extent of any clearing of vegetation and the colour, texture, style, size and type of finish of any materials to be used in any development."

Further to this in Schedule 4 Items of Environmental Heritage landscapes are again defined as shown on Figure 3.2.

- *Wingen/Scone Scenic Protection Area: this area is traversed along its eastern side by Kingdon Ponds and along its western side by Middle Brook, with Dry Creek in between.*
- *Lower Dartbrook Scenic Protection Area: this area encompasses the river flats of Dart Brook and its tributary streams.*
- *Momberoi Scenic Protection Area: this area comprises the valleys and streams which rise in the Liverpool Range between Mt. Tinagroo and Towarri Mountain and fall away to the south to join Dart Brook.*
- *Segenhoe/Rouchel Scenic Protection Area: this area comprises the fertile flats at the lower end of Pages River and the section of the Hunter River below Glenbawn Dam, together with Rouchel Brook, which joins the main stream from the east.*
- *Moonan Flat Scenic Protection Area: this area comprises a succession of river meanders and undulating hills, with rolling pastures and scattered woodlands, and stretches from the Mount Royal Range in the north to Glenbawn Dam in the south.*
- *Rossgale Lookout, Gallaghers Mountain and Castle Rock.*

3.5 Upper Hunter Land Use Strategy

The Upper Hunter Land Use Strategy has also identified the need to conserve the Upper Hunter rural area's built heritage that includes 4 scenic landscapes at Wingen/Scone, Lower Dartbrook, Momberoi and Sedgenhoe/Rochel. These scenic landscape areas are also covered by special provisions of the Scone LEP discussed above in Section 3.4.

3.6 ACNT/Auswind Landsape Assessment Methodology (June 2007)

The Australian Wind Energy Association and the Australian Council of National Trusts prepared a report titled:

Wind Farms and Landscape Values, National Assessment Framework Final version 27June 2007

This report evaluated the landscape and visual interactions that are created by a wind farm and established best practice procedures for identifying and assessing landscape values, visual impacts, mitigation strategies and community consultation.

The visual assessment process carried out in this report is responsive to the processes defined in the framework that refers to visual assessment. An assessment of the landscape to determine landscape values an assessment of the wind turbine development as part of the total Energy Park and its visual impact and the development of mitigation strategies has been completed.

Community consultation was carried out by others on a one to one basis. A Community Information Day was held during the preparation of the visual assessment,, see Figure 3.3 where visual implications of the Kyoto Energy Park and especially the wind turbines were discussed and displayed in terms of preliminary photomontage results and mitigation strategies at point of viewing allowing for view retention were also illustrated., It was clear from that forum that visual considerations of the wind turbines were a major concern for the community.

4.0 PROPOSED DEVELOPMENT

4.1 Components of Energy Park

The Kyoto Energy Park consists of a number of energy generating components as well as support elements. The wind turbines are the major visual element. The wind turbine elements are located on two separate wind farm sites at Middlebrook Station and Mountain Station, see Figure 4.1a. Other energy generating components include a solar power plant and a closed loop-hydro facility are located on Mountain Station only, see Figure 4.1b

Support elements with potential visual effects include:

- Construction depot and laydowns
- Concrete Batching Plant
- Managers Residence and Interpretive Centre
- Maintenance Shed
- Site access and Permanent tracks
- Transmission lines connecting to the state electricity grid.

4.2 Visual Character of Minor Energy Park Components

While the major visual elements of the Kyoto Energy Park are the wind turbines on Mountain Station, with 31 turbines and Middlebrook Station with 11 turbines, the visual character of the energy park results from all the development elements that are proposed within the energy park. This includes not only the wind turbine towers, but also the construction and ongoing management elements such as roads, buildings, sub-station, and transmission lines associated with the project. The most significant of these are discussed below.

Concrete Batching Plant, Site Offices and Laydown area

This area is located within a clearing within an open woodland setting adjacent to the existing access track to Mountain Station. It occupies an area of approximately 50m x 40m. This area will from time to time have various construction components that will include various wind turbine components. This area will be rehabilitated on completion of the construction phase, but will have little visual effect towards the Bunnan Road aspect even during the construction phase.

The concrete batching plant would have various storage and batching towers that can be up to 10-15m high. However all these elements would be temporary structures for the construction process and have very little visual effect as they are shielded view shed.

Any potential visual effect that will occur will only be experienced from a limited length of the adjacent Bunnan Road during the construction period. Any visual effect would be filtered by existing woodland areas. The location of these elements is illustrated in 4.1b.

Access Tracks

Access Tracks are a major construction element. They are required to be of a horizontal and vertical alignment and scale to allow for construction vehicle movement. The resultant grades may result in minor cuts and fills on side slopes adjacent to the ridge top. In some cases this could also involve tree clearing and would always involve grass cover clearing. It would be anticipated that most sections of track will be either on the ridge top or to the west of the main ridge line.

The Visual Effect of vegetation clearing and earth works would be to create line and colour contrast in the landscape. The colour of the road surface and cut and fill batters would contrast with adjoining grass and tree cover areas. In most instances the line created by the road formation would create contrast with the lines of the adjoining hills and gullies.

This Visual Effect would decrease in the short term as reduction in scale after construction and rehabilitation of road batters occurs. Visibility to access tracks from external view areas is likely to be limited due to topographic and vegetation features of the landscape.

Managers Residence and Visitors and Education Centre

Buildings would create form, shape and line in the landscape. However, generally the buildings and support elements of these facilities have a domestic scale and are not likely to cause a major Visual Effect. This low visual effect level would be further aided by the potential for siting these facilities within the folds of the landforms and to use existing and or planted vegetation to screen and or visually integrate these elements into the hillside. This includes the Manager's residence, and Visitors and Education Centre .

The Visitor and Education Centre will be located adjacent to an easterly escarpment. It will be a low flat single storey building set into the escarpment. The Managers residence is proposed as a two 2 storey building with elevations below 8m. The Visitors and Education Centre will be single storey with a maximum elevation of 6m and will be integrated with existing vegetation and additional planting to ensure very high levels of visual integration creating low visual effects.

Site Substation and Maintenance Building

The substation is also relatively low with the associated transmission line towers being of greater elevation. The substation would occupy a rectangular area not exceeding 60m by 40m with an elevation of elements generally not exceeding 5m. Powerlines within the Mountain Station and Middlebrook Station sites between the wind turbines will be underground power cables buried within trenches.

The maintenance Building would be situated in a clearing adjacent to the existing access track on Mountain Station. The proposed location of the building is in a cleared area close to the proposed location of the substation. The location of the maintenance shed is back from Bunnan Road and is well shielded from existing vegetation along the road.

Wind Monitoring Masts

The wind monitoring masts are already in place. They consist of two guyed narrow lattice towers. The thin sections of the lattice and the guys ensures that these elements have a limited visual effect on external view areas.

4.3 Solar Photovoltaic (PV) Plant

It is anticipated the solar component of the project will be constructed along the Mt Moobi Plateau located to the south-east of the Mountain Station property. From a visual perspective the significant element will be the arrays of solar panels that will be arranged in banks or linear rows with the panels or parabolic collectors generally orientated towards the north, see Figure 4.1b and 4.2

Four options exist for solar panel arrangements (low fixed type solar frames, single or dual axes tracking frames, and parabolic dish type arrangements) have been proposed. The visual profile of the solar panel banks as they present to eastern views will be critical. The panels will be angled to the sun and will vary in elevation from approximately 1.5m to 4m at the highest point. If these panels are visible to external eastern view, the repetitive banks of panels would create a series of angled lines in the landscape. However this visual effect would be easily mitigated by low tree planting to the east of the panel arrays.

If parabolic collectors are used these would be a maximum of 14m tall and would require larger trees to achieve screening or integration from eastern views. As an additional strategy for the dish collectors, moving the solar panels back 50m from the ridge line would assist in screening the closer more critical view points.

There will be no reflected light from the collectors on surrounding residents as they will be orientated to the sun.

These alternative solar collectors are illustrated in Figure 4.2.

4.4 Closed Loop Hydro Plant

The mini-hydro power plant will consist of two sets of tanks (header and receiving tanks), the header tanks at the top of the pipe race and receiving tanks at the bottom of the race, see Figure 4.1b. An inlet turbine connected to the discharge pipe will generate the electricity and a small turbine power plant will be located adjacent to the receiving tanks. Generated electricity will be fed to the Mountain Station substation via underground cable.

The hydro plant is well located within a steep drainage line on the eastern escarpment. The location is well screened by adjoining topography as well as open woodland tree cover. The upper tanks and pipe race is not screened by tree cover, but will be screened by adjoining topography.

Any potential visual effect of these elements on the ridge line would be easily mitigated by screen planting.

4.5 Visual Considerations of Transmission Line Options

The final transmission line corridor and line configuration will depend in part on the final configuration of the Kyoto Energy Park and local network conditions at the time of connection. On this basis 4 possible line route options exist. These options include connection to 3 possible connection points on the local grid network. These are at Scone, Dartbrook Mine and Muswellbrook. Figure 4.3 illustrates those options

Option 1.

Based on the development of Middlebrook and Mountain Station sites the system will consist of a combination of 33kV and 66kV transmission lines.

A 33kv transmission line is proposed to connect from Middlebrook to the substation at Mountain Station and the 66kV transmission line will link the Mountain Station substation to the connection point at Scone Substation. With this development, a combination of the 33kV and 66kV transmission lines would use the same pole structure from the Mountain Station sub-station to the point where the Middlebrook line joins onto Bunnan Road. A separate pole for communications would be required on the other side of the road along the Bunnan Road only in between the two sites. From this point on towards Scone the route would support the 66kV and distribution lines already existing along this route option.

Option 2.

Option 2 commences at the proposed substation on Mountain Station and leaves the site between wind turbine 26 and 31. It then follows two minor option routes along existing electricity line easements or along unnamed road reserves in an easterly direction to Yarrandi Road just west of its intersection with Moobi Road. It then follow onto Moobi Road to its intersection with Satur Road and Liverpool Street and from here joins onto Option 1 with its various options in the vicinity of Scone.

From where Satur Road meets Moobi Road at Liverpool Street Option 1 and Option 2 have a number of alternatives as discussed below.

Variations to Options 1 and 2 within vicinity of Scone.

Option 1A/2A

This option follows along Liverpool Street to Aberdeen Street and skirts the golf course along its western and southern boundary. It then crosses the railway and highway to a site south of the high school to the site of the proposed Scone Substation.

The proposed 66kV transmission line could replace the existing distribution line and would undersling this line on the new structure along roadways and to the south of the golf course leading to the new proposed substation.

Option 1B/2B

This option follows option 1A along Aberdeen Road but then follows Kingston Street and Main Street to the highway, joining back on to Option 1A as it heads west to the proposed substation site.

This option would be undergrounded along the New England Highway

Option 1C/2C

This option follows Liverpool Street for a short distance and then turns south to the west of Middle Brook and crosses rural land (DP 829664) prior to turning east crossing Middlebrook and crossing Council owned land and road easements to the Energy Australia Substation south of Gundy Road.

From a visual perspective Option 1C is preferred to 1A which in turn is preferred to 1B. Opion 1C minimises interaction with the more sensitive urban view locations and has the capacity to be screened or integrated by creekside vegetation.

Option 1c minimises the use of urban roadways (Please review this comment as Option 1B in all witin roadways) and allows for better landscape solutions for visual integration than 1b.

Construction options will vary depending on the combination of the 33kV with the 66kV and the combination of the 66kV with the various distribution lines along the various routes. These options are discussed in the VEMTEC report. Figure 4.4a and 4.4 b illustrate various transmission line and distribution lines, singularly and in combination.

Poles can be timber or coloured concrete and the preferred visual configuration is for a single circuit 66kV line with the distribution line adjacent rather than a double circuit 66kV line with the distribution line underslung.

Visual Preferences in relation to Options 1 and 2 within the Vicinity of Scone

The development of Option 1 and 2 depend on the final layout of the wind turbines and hence stating a visual preference is not appropriate except to say that option 2 is preferred as it through rural lands and utilises minor rural roads more so than option 1.

In close proximity to Scone Option 1C is preferred to Option 1A and 1B as it utilises more rural lands and IA is preferable to 1B as it utilises golf course edges. Both the rural lands and golf course edges have a greater capacity to visually integrate the transmission poles into the landscape and have less sensitive adjacent land uses.

Most roads that are utilised in these options support various power lines that would be incorporated into the new line structure, see figures 4a – 4c

Options 3.

Option 3 is a combination of a 33kV and 66kV overhead line. A 33kV would be used to interconnect Middlebrook Station with the proposed substation on Mountain Station. A 66kV line would reticulate power to a tee connection at Dartbrook Mine. The proposed route for the 66kV line would follow Bunnan Road to the intersection of Yarandi Road (Back Muswellbrook Road). The proposed line would displace the existing 11kV line along Yarandi Road to the proposed Dartbrook mine connection point.

Option 4

Option 4 is a combination of a 33kV and 132kV overhead line. A 33kV would be used to interconnect Middlebrook Station with the proposed substation on Mountain Station. A 132kV line would reticulate power to a direct connection to the Muswellbrook STS, located just north of Muswellbrook township along the New England Highway. The proposed route for the 132kV line would follow Bunnan Road to the intersection of Yarandi Road (Back Muswellbrook Road). The proposed line would displace the existing 11kV line along Yarandi Road to the intersection of Burtons Lane. From the intersection of Yarandi Road and Burtons Lane two variations are proposed for the extension to the Existing Muswellbrook STS.

Option 4 a

This option follows the existing line route via Back Muswellbrook Road to junction of Kayuga Road and the New England Highway. Along the New England Highway the route displaces the existing 11kV lines travelling north to the connection point at Muswellbrook STS.

Option 4 b

Option 4b diverts from Yarandi Road across Burtons Lane to the intersection of the New England Highway crossing the New England Highway to the connection point at the existing Muswellbrook STS.

Preferred Visual Options.

It is appreciated that there will be a number of functional and environmental factors that will influence the route options. However the following are the visual preferences.

In the northern sector of the route options in the vicinity of Mountain Station and Middlebrook Option 2 is preferred to Option 1 as it uses rural lands and minor rural roads.

Within the vicinity of Scone Option 1 C is preferred.

With regard to the four options, option 3 and 4 are preferred to options I or 2 due to the avoidance of township areas. They also have existing powerlines, see Figures 4.4b - 4.4d, that would be incorporated into the new powerline structure.

Option 3 is preferred to Option 4 due to decreased length

Option 4B is preferred to Option 4A due to the more direct route and its distance from township areas.

Following route selection (which in significant part is dependant on the final layout of the Kyoto Energy Park), visual mitigation strategies would be provided.

4.6 Visual Considerations of Wind Turbines

Scale

The wind turbine component of the Kyoto Energy Park needs to be considered in terms of both vertical and horizontal scales. The vertical scale of eighty metres (80-105m) high towers, with 45-50m radius blades gives an overall height of 125-150mm for each tower. In addition the blades create movement in the landscape, potentially increasing views to them as movement in the landscape has the potential to draw the eye, see Figure 4.5.

When this 150m high element is considered in the context of the hills it would be on, as viewed from the adjoining valleys, the apparent scale of the wind turbines will be at its greatest. At this local scale, the wind turbines would be seen only in the context of the hills they are be on and in a small local landscape context, increasing its apparent scale.

As distances increase, the vertical scale of the wind turbine elements will reduce significantly, but may remain visible at distances over 30 km dependent on local weather conditions.

A single element of this scale may be visible in the landscape for great distances. However if it were just a single tower, its visual effect would be greatly reduced by occupying only a very small part of the Primary View Zone. As the wind farm extends over many kilometres, a strong Visual Effect would result in certain situations, especially when viewed from within the local landscape setting of the wind farm sites.

When horizontal and vertical scales of the wind turbines are considered together the 42, 150m high turbines have a large scale in the local landscape setting. This reduces as distances increase. The wind turbines would generally become less than 5% of the Primary View Zone at

distances of 6 km to 7 km depending on the percentage of wind farm that would be seen and the angle at which it would be viewed (see Figures 6.2 – 6.5)

Skyline Location

The skyline is a location of maximum visual contrast between the varied shapes, lines, colours and textures of the 'land' that contrast with the generally simple and uniform colour and texture of the 'sky'. Also, development elements in this location are generally in an area of higher visibility because of elevation.

Further the Wind farm ridge line location, offers only rare visual integration opportunities as the sky is generally of uniform colour, low texture values and does not have line, shape or pattern characteristics other than that offered by ephemeral weather conditions, e.g. clouds, etc.

Dependent on diurnal conditions of light and cloud cover, wind farms in this location, because of scale, line and movement, are very visible in the landscape.

Component of the View Affected by Wind turbines

The view invariably consists of a landscape skyscape component. Wind turbines affect the sky component of a view, and can be considered to alter the profile of the horizon, especially in more localized viewing locations. This has significance in amelioration strategies as the land component of a view can remain almost totally open to view, while that portion of the skyscape affected by the wind turbines needs to be filtered to achieve visual integration or screening.

In this context, the potential backgrounding effect of the forested hills and mountains of the main east west range to more distant views from the south will be of some value in relation to the Middlebrook Station Section of the Kyoto Energy Park. However this backdrop losses effectiveness from closer viewing points.

Simplicity of Structures

Wind turbines are visually unique in terms of scale, but also the simplicity of structures, when compared for example with transmission lines. The simplicity of line, coupled with repetitive form of the multiple towers can create a strong visual statement in the landscape. Also the visual contrast between the rolling lines of the hills and the pattern of vegetation and in some cases rock formations and the pale coloured poles creates an abstract picture which emphasizes the visual characteristics of both the landscape and the development.

While wind turbines are large scale, they are simple and elegant almost sculptural forms that lack the visual clutter and complexity of other large scale elements such as transmission line towers or power stations for example.

Another visual perception that would be appreciated by some is the symbolic link that these 'futuristic' wind mills represent in relation to sustainable futures. Increasingly in this time of climate change, the visual perception of the wind farms may increasingly be positive due to viewer knowledge about the clean energy it is generating.

5.0 EXISTING VISUAL ENVIRONMENT

5.1 The Site

The proposed Kyoto Energy Park consists of two separate sites located west of Scone, in the Upper Hunter Shire Council area. The two sites comprise landholdings referred to as Middlebrook Station and Mountain Station. Middlebrook Station comprises and area of approximately 2032 ha and Mountain Station an area of approximately 2013 ha.

Middlebrook Station Site

The Middlebrook Station site is located approximately 9 kilometres north-west of Scone. The Middlebrook Station site is part of the Glen Range, and is a single ridgeline which runs approximately north-south. Middlebrook Station has an elevation between 580m and 620m. The area is covered with open forest and has steep slopes as well as cliff areas (see figure 5.1a) The site has distinctive visual character created by the integrity of the setting as well as the geological feature of Castle Rock and adjoining cliffs.

Mountain Station Site

The Mountain Station Site is located approximately 10 kilometres west of Scone. The Mountain Station site is an area of escarpments and ridges on the western side of the Hunter Valley. The proposed wind turbine component of the Energy Park lies on a prominent escarpment called Mount Moobi and nearby ridgelines. These features have an elevation between 600m and 640m and run approximately North-South. Terrain slopes around the main ridge can be described as moderate to the west and complex in all other directions, as there are steep slopes present, particularly to the east.

Vegetation is mainly open grassland, with occasional scrub and scattered trees. The tree cover is more dense on the side slopes of some ridgelines and the main escarpment, which is itself predominantly cleared pastoral land that is mainly used for sheep grazing and agricultural purposes (figure 5.1b).

Mountain Station although having some distinctive features in the rock outcrops at Moobi Rocks and the Little Gap, is more common to the character type of rural hills with more gentle sloping areas at both the top and bottom of the hill cleared for grazing purposes.

5.2 Primary Visual Catchment.

The Primary Visual Catchment encloses the most critical areas that have potential views to the proposed wind turbines. It is possible for areas outside this catchment to have views, e.g. long views from the New England Highway, but intervening topography may limit the extent to which this is possible and increased distances to viewing locations, significantly reduces visual effects and sensitivity.

For the purposes of the visual assessment of the wind turbines the primary visual catchment is defined by the mountain range to the north, the hills to the east of Scone, the Hunter Valley to Muswellbrook and the hills to the east of Bunnan, see Figure 5.2.

Visual impacts outside the primary visual catchment are not considered to be significant when compared to those in much closer proximity within it.

The Landscape Setting of the Kyoto Energy Park

In this locality the landscape is a dynamic mix of the broad valley bottom adjacent to Dart Brook, Kingdon Ponds and Middlebrook, small valleys adjoining feeder creeks such as Thompsons Creek and the northern hills and mountain ranges. The mountains and hills are increasingly enclosing of the valley in this locality. This contrasts with the broader valley settings of towns in the mid and lower Hunter River such as Singleton and Muswellbrook.

Within the vicinity of the Kyoto Energy Park and within the Primary Visual Catchment there are a number of Visual Character Units (VCU), see Figure 5.2. These include:

- Townships & Villages VCU
- Broad Valley VCU
- Enclosed Valleys VCU
- Wooded Hills VCU
- Northern Hills and Mountains VCU

These VCUs have a range of physical characteristics and geographic location that are the basis of the way they contribute to the visual values of the landscape. Each of the Units while having certain visual characteristics in common have great diversity within themselves that contribute to their visual interest. This visual and scenic value is increased as often these units are seen together e.g. the Broad Valley, Western and Northern Hills and Northern Forested Mountains.

5.3 Townships & Villages VCU

Description

The main township in the locality is Scone. However other towns and villages also are also located in this Upper Hunter location. These include the town of Aberdeen to the south and the villages of Parkville, Wingen and Murulla to the north and village of Bunnan to the west, see Figure 5.3

With the exception of Bunnan, these towns are located in the matrix of the Broad Valley that adjoins the creeks of the Upper Hunter River. For the greater part they occur on the flat plains although extensions of them can occur in adjacent hilly locations.

The towns have to varying degrees the full range of urban and building land use types from the commercial main street to residential areas adjoining. In addition to the built form of the townships there is also generally a good deal of cultural planting of both native and exotic trees within streets, gardens and less significantly parks.

Visual Significance

The visual expression of the towns vary from one that is external to the town, to one that is within the town, its many streetscapes and views obtained from private properties onto the streets, across other town areas and into the rural hinterland beyond the town.

Of greater visual significance is that the town is a locality of multiple high sensitivity receptors due to the residential and historic/tourist commercial precincts of the town.

Also significant is that the buildings and vegetation within the towns often screen long distant views to adjoining rural areas. In this way the more traditional town areas are inward looking whereas the more recent hill side residential areas take in distant rural views. This is less so for houses located in hilly locations such as the newer subdivisions to the south east of Scone.

The towns have a range of distinctive and common visual quality features, which reflect the architecture of the building stock and or tree cover in any given visual setting.

5.4 Broad Valley VCU

The Broad Valley consists of the open valley floor that adjoins Dart Brook, Kingdon Ponds and Parsons Gully. This gently sloped area is used in no small part for improved pasture with less fertile and hilly areas left as grassland. Tree cover in the form of scattered trees, linear bands and clumps occur on less fertile hillier slopes, along gully or creek lines and roadways as well as around homestead and farm buildings, see Figure 5.4

The overall impression is of an open grassland area punctuated by residual indigenous treed areas in the typical random pattern of the rural Australian landscape and or the more formal planting pattern resulting from cultural plantings along roadways, driveways and around

homesteads and farm buildings. A large proportion of this landscape has been altered due to clearing from subdivision or other land use activities.

Visual Significance

This VCU is seen in many of the views as part of a sub-regional and regional landscape setting, often forming the foreground to a viewer location such as the New England Highway or town views such as Aberdeen or Scone.

It is also significant in that it creates the opportunity for long distant views to the wind turbine sites due to its openness in the critical view area immediately adjacent to the viewer.

The Broad Valley VCU supports many viewer locations. These locations include:
the New England Highway , the townships and homesteads along roads including Nandowra, Moobi and Cliftlands Roads in the southern parts of the VCU and Bunnan and Middle Brook Roads to the north as well as from the roadways themselves.

The Broad Valley represents a common rural landscape within the Australian rural landscape context. However within it there are some local settings that have visual variety to create a distinctive view.

The Broad Valley VCU is in part contained within two designated landscape areas under the LEP namely the Wingen/Scone Scenic Protection Zone and part of the Lower Dart brook Scenic Protection Area.

5.5 Enclosed Valleys VCU

The small enclosed valleys occur in the northern parts of the primary view zone adjacent to: Dry Creek, Middle Brook, Thompsons, Sparks and Kiernans Creeks and Dart Brook.

There is generally only a narrow variable width strip of gently sloping land adjacent to the creek lines enclosed by surrounding hills. Land form within this unit is dominated by the rolling hills of the valley sides. The gentle creek side areas are dominated by pasture grasses and crops with trees limited to creek side and in some cases roadside locations. Hillier adjoining slopes are dominated by open grassland with scattered tree cover on more gentle slopes to woodland cover on steeper areas, see figure 5.5.

The VCU also supports a series of homesteads that also contribute to the landscape pattern through the built form and adjoining plantings creating small focal points in the landscape.

This VCU is highly patterned. The pattern being created by varied vegetation pattern on constantly varying land form features.

Visual Significance

The enclosed character of the valleys often only allow for local views that incorporate the valley and adjoining valley edges that may also include parts of the Northern Hills and Mountains, that in places will be occupied by the Middlebrook Station wind farm site.

Longer views are generally down the valley from elevated locations within the VCU. These locations are often used for homestead sites. These locations could give views to Mountain Station.

The Enclosed Valleys are a common rural setting. However the varied topography and land cover coupled at times with creek settings often create locally distinctive settings.

This VCU is in part within the Momberoi Scenic Protection Area.

5.6 Eastern and Western Wooded Hills VCU

The wooded hills create strong visual enclosure to the Broad Valley and the towns and Villages within the valley, see figure 5.6. The unit adjoins the Broad Valley VCU at an elevation of

approximately 270m. It is dominated by steep slopes that are covered in woodland and open forest. The wooded hills reach elevations of 428m - 651m to the east of the Broad Valley VCU and elevations of 500m to 640m to the west of it.

The western hills vary from the eastern hills in that they have more rugged topography having minor cliff formations and significant areas of rock outcrops. These geological features of the western hills greatly add to their visual variety quality especially when viewed in a local context from roads such as Moobi Road and Bunnan Road.

The exposed geological formations along with varied topography and vegetation create strong pattern at the sub-regional scale and strong form at the local scale.

The VCU is common in many ways however it is very distinctive in parts where geological formations are a part of the local view setting as seen from locations such as parts of Bunnan Road near Little Gap and Moobi Rocks as seen from many areas to the east..

Visual Significance

The hills create the visual edges to the broad valley when seen in most visual settings. They also create the outer edges of these visual settings, screening out land areas beyond them.

The Mountain Station section of the Kyoto Energy Park is within this VCU.

The Wooded Hills are a common landscape feature in the Australian landscape. However in relation to the western hills as seen from some local and sub-regional view locations create a distinctive landscape setting due to the exposed geological formations in some localities, see figure 5.6.

5.7 Northern Forested Mountains VCU

The northern mountains are forest covered and have very steep terrain. The main Liverpool Range runs generally east west and forms. This VCU is contiguous with the Northern Hills and Mountains with fingers running north south and including areas such as Towarri National Park and is to the north of this VCU

Visual Significance

The VCU forms a backdrop to the regional landscapes of the broad valley and hills as well as for the northern hills and enclosed valleys of Middle Brook, Thompsons Creek, Sparkes Creek and Kiernans Creek.

5.8 Northern Hills and Mountains VCU

The northern hills and mountains occupy areas of very steep terrain. These areas generally retain forest cover, although some areas may be cleared. The main Liverpool Range runs generally east west with north - south ridges running of this range and between all the creeks in the locality, e.g. Middle Brook, Thompsons Creek, Sparkes Creek and Kiernans Creek, see Figure 5.7.

Middlebrook Station the site of 11 turbines, is located on the ridge between Middle Brook and Thompsons Creek within the VCU.

The steep north south ridges vary in elevation from 450m-600m, with the main range exceeding these elevations and providing a backdrop to the ranges and Enclosed Valleys in this location.

The north south ranges within the VCU have distinctive geological characteristics with many of the ridges having exposed cliffs and rock features.

The Glen Range on which the Middle Brook Station wind turbines are sighted has numerous cliff formations as well as rock features such as Castle Rock and other prominent rock formations north of castle rock.

The Towarri National Park and the Wingen Maid Nature Reserve are within the VCU.

Visual Significance

The visual significance of this VCU is its presence in most landscape settings and views due to the visual prominence of the range and ridges in relation to the less prominent hills and valleys of the primary view area.

The VCU has a distinctive character at all scales. At a regional scale, the unit provides a dark and contrasting background to the more open and lighter colours of the foreground rural landscapes. At a sub regional scale and at a local scale the visual diversity and focal interest created by the exposed geological features contrasting with a background of forested ridges creates a distinctive landscape in the region, see figure 5.7.

The distinctive landscape features are recognized in the 7 (a) zoning. Further to this *Castle Rock* is included in Schedule 4 Items of Environmental Heritage Landscapes within the Scone LEP as shown on Figure 3.2.

The Middlebrook Station component of the Kyoto Energy Park is located in the Forested Hills and Mountains VCU.

5.9 Summary

The landscapes within the primary visual catchment and visual settings of the wind turbine sites on Mountain Station and Middlebrook collectively exhibit great visual diversity. While many elements are common to the Australian landscape, many are distinctive. Special visual value is derived from the rock formations in both wooded hills to the west of Scone and the Northern Hills and Mountains.

6.0 VISUAL EFFECTS OF ENERGY PARK COMPONENTS

6.1 Minor Components

As outlined in Section 4 of this report, the Kyoto Energy Park has other development components in addition to the wind turbines. These include:

Operational Elements

- Solar Photovoltaic (PV) Plant
- Closed Loop Mini-hydro facility
- Site substation
- Visitors and education centre
- Managers residence
- Maintenance shed
- Permanent Access tracks
- Internal underground power cables
- Bushfire Asset Protection Zones (APZs)
- Electrical and telephone services
- Transmission lines connecting to the electricity grid.

Construction Elements

- Construction depot and laydown area
- Concrete Batching Plant
- Site access points

All of these elements have a visual effect. However the extent to which such an effect is significant depends on the scale of the development component and the effectiveness of on site vegetation and or topography to screen it from external view. Where appropriate the visual effect of these elements is discussed below.

Solar PV Plant

The solar plant is located on the eastern edge of the Mountain Station Site adjacent to wind turbines 27-31, see Figure 4.1b. It will consist of arrays of solar panels arranged along short east west rows with the panels set at approximately 30 degrees of the horizontal to face the northern sun.

There are 4 options for solar panel arrangements. Options 1-3 vary in height of 1.5m to 4m above ground level. Option 4 has a maximum height above ground level of 14m. Currently these panels are located in cleared areas on the ridge line, so that they may be visible from adjoining eastern valley areas.

As seen from these areas they will create a series of lines and shapes that will have a strong contrast and low integration with the existing landscape. This will create a high visual effect if it occupies more than 5% of a primary view. However these elements are set amongst wind turbines and are much smaller in scale and will be screened in part by the adjoining ridge and proposed landscape works.

Closed-loop Mini-Hydro Facility

This facility is located within a ravine that encloses the pipelines and holding tanks with both topography and vegetation. The screening effect of these features will ensure that this facility has little visual effect on external view areas.

Site Offices/Depot and Laydown Area

This area is located in the north western part of the Mountain Station site and is adjacent to the access road from Bunnan Road. It is set in woodland and will be some 200m from the road.

The area is located on a gently slopes and is surrounded by woodland. The area will be cleared and will have construction material within it. However the surrounding vegetation and topography will screen it from significant view locations, minimizing any visual effect potential of this work area.

Managers Residence, Visitors and Education Centre, Maintenance Shed and Substation

These elements will have low visual effects due to their limited vertical scale and location within woodland that will screen views from the adjoining viewing locations. Further landscape treatments will ensure that they are successfully screened.

Other Minor Elements

These include permanent tracks, bushfire asset protection zones (APZs) water, electrical and telephone services including underground and overhead lines will not have significant visual effects due to limited vertical projection and the screening effect of adjoining topography and vegetation.

Transmission Lines

The transmission line development was discussed in Section 4 of this report. A number of transmission line routes were considered with the final route selected depending on the final configuration of the wind farm components of the Kyoto Energy Park.

In most situations the transmission line will follow along roadways that already support distribution lines and will replace them, supporting the existing distribution lines on the new pole structures. These will be larger in scale than existing lines and the configuration will depend on the need to accommodate one or two high voltage circuits. The distribution lines are to be accommodated on the same transmission pole. This will vary from location to location and will vary from rural to urban situations.

However in most situations the visual effect should be moderate given the location of the existing distribution lines along the routes. Also existing vegetation in various locations will also have an effect.

In all cases both rural and urban it will be possible to decrease the visual effect levels by introduction of street and road side planting depending on the existing visual setting and the configuration of the power line in any given location.

6.2 Overview of Wind Turbines

In the first instance, for the wind turbines to have an effect on a viewing location, it must be seen. Seen areas based on topography alone are illustrated on the Zone of Visual Influence Map, see Figure 6.1.

This seen area mapping takes no account of the very real potential of foreground vegetation and or other elements, e.g. buildings in urban areas, eliminating or filtering views to the wind turbines. These elements have the potential to greatly reduce the visibility and Visual Effect of the turbines. For example, the ZVI map illustrates that Scone can see all of the wind turbines. However there are many locations within the town from where only some or no turbines can be seen due to the effect of foreground buildings and or vegetation screening such views.

Because the wind turbines would be seen from a number of different locations the Visual Effect will be different in each case as the visual perspective of the turbines will alter. This would be especially relevant to the scale of the turbines in the context of the landscape it would be viewed in, or put another way the percentage of the seen area of a view taken up by the turbine component.

6.3 Visual Effect of Wind Turbines

As outlined in Section 4, Proposed Development, the wind turbines needs to be considered in terms of both vertical and horizontal scales. The vertical scale of 80 - 105m high towers, with

45m radius blades gives an overall height of 125 - 150m for each wind turbine. The horizontal spread varies depending on where the turbines would be viewed from and varies from approximately 6km when if viewed from the south or the north to 13km with a 4.5m gap when viewed from the east or the west.

When the horizontal and vertical dimensions of the wind turbines are considered together, the wind turbines that have an elevation of 125-150m elevation would have a large scale in the local landscape setting. When 100% of the turbines are seen, (see figure 6.1.) They would occupy an area of from 0.9 km^2 to 1.32km^2, when considering their height and spread. This area and variation of it determine the percentage of any primary view zone that is occupied by turbine elements.

This percentage of the primary view zone or of the much larger total seen area, of the landscape that is occupied by the wind turbines, is affected by distance. For example from 2km away where the Primary View Zone would be only 2.09km^2, the turbines represents a large percentage, at approximately 13% But at 10km this Primary View Zone is 52.35 km^2 making the turbines a much smaller proportion (2.3%)of this primary view area.

Hence, the scale of the wind turbine component of the energy park reduces as distances increase. The turbines will generally become less than 5% of a Primary View Zone at distances of 3.5 km to 7 km again depending on the percentage of the turbines that would be seen and the angle at which it would be viewed.

The Visual Effect of the wind turbines therefore would be dependant on how much of the Primary View Zone, the most critical part of a seen area, they occupy. This decreases with distance, see figures 6.2 – 6.5, and also depends on foreground screening levels created by vegetation or other elements, and integrational effects from cloud cover.

6.4 Visual Effect Levels

Given the high visual contrast and low visual integration of the wind turbines as defined in Section 2, see figure 2.4, the Visual Effect of the wind turbines can be considered as dependant, in part, on the number of wind turbines seen. This is expressed as a percentage of the total wind turbines seen (see Figure 6.1). This level of visibility was then evaluated as a percentage of the Primary View Zone that would be occupied by the wind farm elements as seen from any given location, see figures 6.2 – 6.5.

As defined in the methodology used in this visual assessment, see section 2, the Visual Effect levels created by the wind turbines are based on the percentages of the Primary View Zone they occupy

In this way:

- a High Visual Effect occurs if the wind turbines occupy more than 5% of the Primary View Zone;
- a Moderate Visual Effect occurs if the turbines occupy between 2.5 – 5% of the Primary View Zone;
- a Low Visual Effect occurs if the turbines occupy less than 1 – 2.5% of the Primary View Zone

Because the wind turbines would be seen from a number of different directions, the horizontal distance or perceived spread of the turbines varies. To cater for this, 9 directional sectors are defined: North, South, East and West as well as NE, SE, NW and SW. From these view zones there will be four width variations:

- East and West being the same at approximately 13.1km of horizontal distance covered by the wind turbines with a 4.5km gap between Mountain Station and Middlebrook Station sites when viewed from this sector;

- North and South being the same at approximately 6.133km of horizontal distance covered by the turbines with no meaningful visual gap apparent between Mountain Station and Middlebrook Station sites when viewed from this sector;

- SE and NW being the same at approximately 12 km of horizontal distance covered by the turbines with a 5.86km gap between Mountain Station and Middlebrook Station sites when viewed from these sectors;

- NE and SW being the same at approximately 8.8km with no perceivable gap between Mountain Station and Middlebrook Station;

- The north sector is central to the surrounding eight and has viewing properties.

These horizontal distances multiplied by the maximum height of the turbines, 150m, gives the arc of the view that is occupied by turbines.

Important also to a consideration of the amount of the view occupied by the wind turbines would be the number of them that can be seen from various locations, if all 42 are seen 100% of the turbines would be visible. If only 7 turbines are visible then only 15% of the total wind turbines can be seen.

On this basis, wind turbine visibility was mapped at the following levels:

- 35 - 42 turbines seen (100% visible)
- 26 - 34 turbines seen (80% visible)
- 15 - 25 turbines seen (60% visible)
- 9 - 17 turbines seen (40% visible)
- 1 - 8 turbines seen (20% visible)

These visibility levels are illustrated in the Zones of Visual Influence ZVI Map at Figure 6.1 and are based on the topography of the area only.

While the ZVI is important and a good indication to likely visibility of the wind turbines based on topography alone, it is possible that the wind turbines is not seen from some locations where visibility is indicated due to the presence of foreground vegetation and or built elements. For example the turbines are visible from Scone's main street as accurately suggested by the ZVI however buildings along the street screen it from view except at intersections where roadways crossing the main road create view corridors to turbines on Mountain Station.

A consideration of both the number of the wind turbines that would be seen (Figure 6.1) and a calculation of the percentage of the Primary View Zone occupied by it, see figures 6.2 – 6.5, determines the Visual Effect. On this basis the Visual Effects of the wind turbines on surrounding areas within the various sectors have been calculated and mapped in Figure 6.6. A conservative approach is taken in that the upper percentage of the wind turbines that are seen is assumed in all cases.

The Visual Effect levels illustrated in Figure 6.6 does not take into account the effect of foreground screening by defining areas that have such elements, e.g. trees, buildings, etc. Such elements can significantly reduce Visual Effect, potentially from high to low or even completely prevent views to the wind turbines.

The Visual Effects illustrated in Figure 6.6 influence the Visual Impact of the wind farm and are elaborated on in a quantitative way in Section 8 of this report. A qualitative assessment is made possible by a consideration of photomontage images that have been prepared to illustrate Visual Effects from the various sectors and significant land use areas.

6.5 Visual Effect of an Existing Wind Farm

The true visual effect of a wind farm was evaluated by general observation of a number of existing wind farms. The one illustrated, see figures 6.7 and 6.8 is at the Challicum Hills wind farm at Ararat in Victoria. Although the wind farm is located on a range of hills dominated by open highly modified rural landscapes the visual relationship of the wind farm to the landscape and the view as a whole is similar for all wind farms due to their location in a skyline situation.

The Ararat wind farm creates strong contrast by virtue of the line and pattern created by the wind turbines being at variance with the flowing lines of the hills and the total lack of line or pattern in the skyscape component of the view.

When viewed from some roads around the wind farm, it can be seen that it is possible to visually integrate the wind farm into the landscape (see Figure6.9) Foreground trees provide landscape elements that from this viewpoint are of larger scale and also create line in the landscape, taking away visual strength from the wind farm, reducing contrast levels and providing visual integrating elements for the wind turbine structures.

As predicted in the methodology, the wind farm creates strong contrast and has low visual integration. For these conditions of contrast and only low percentages of a primary view zone can be occupied by wind farm elements, i.e. not more than 5%, to ensure that a high visual effect is not experienced.

6.6 Photomontage Illustration of Visual Effects.

Figures 6.11 – 6.17 illustrate the Visual Effect of the Kyoto Energy Park wind turbines on the various settings around the wind farm. Figure 6.10 shows the locations of views used in the photomontage constructions.

They illustrate the visual relationship of the wind farm components to the various foreground, middle ground and background components of the landscape as seen from various locations around the wind farm sites. Visual Effects that are relevant to particular areas are outlined in sector descriptives.

In general there are a number of Visual Effects that are common to all views of the wind farm as illustrated in the photomontage images. These include:

- The wind farm sits in a range of visual settings that include a landscape and skyscape component;
- The wind farm generally sits at the interface of land and sky, commonly known as the skyline;
- The wind farm occupies various proportions of the view, with few exceptions the wind farm impacts on the skyscape component of the view not the landscape component of the view
- The wind turbines towers have strong vertical line and this line is repeated;
- The turbines blades create rotational shapes and line that repeats and are in motion;
- The vertical scale of the turbines is significant being some 150m in effective height;
- The horizontal scale of the wind farm is expansive being from 6km with no gap between Mountain Station and Middlebrook to 13km with a 4.5km gap between the two wind farm sites. in spread depending on which way it is viewed;
- These factors make it a high contrast and low visual integration development that must only occupy small parts of the view especially the Primary View Zone to reduce Visual Effect;
- The Visual Effect of the wind farm component clearly reduces with distance;
- When viewed from a location perpendicular to the turbine rows, turbines are seen as individual elements with large open spaces between them;

- When the turbine rows are viewed end- on, they are seen as clusters. This occurs with various levels of complexity, the highest being when viewed from the north, south, and locations between the two wind farm sites.

6.7 Visual Effects of Shadow Flicker

The visual effect of Shadow flicker has been covered under a separate report prepared by Garrad Hassan.

7.0 VISUAL USAGE & SENSITIVITY

7.1 General

Visual Sensitivity is a measure of how critical a change to the landscape would be perceived by potential viewers. As outlined in Section 2 of this report, there are many factors that go to make up this value. These values are difficult to assess, due to a wide variety of factors that influence personal receptors. However land use and distance are two factors that relate to sensitivity that are measurable.

7.2 Community Perceptions

Community Perception of Wind Farms

The visual perception of wind farms range from majestic, sculptural to a blot on the landscape with a full range of perceptions in between.

Generally, positive perceptions of wind farms are held by the community at large. To them, perhaps, they are an item of visual interest and drama contrasting with the often subtle large scale open Australian landscape and more recently as a positive clean energy image in these days of very apparent climate change.

This broader community perception is generally not universally shared by people who live close to wind farms. These people, to varying degrees, 'use' the landscape into which the wind farm is introduced as part of their everyday visual living environment and differs from the "broader community" in this way.

In these contexts, the introduction of large scale infrastructure, albeit simple and elegant, is not always appreciated, at least not in the first instance. This is due to the more personalized character of landscape appreciation from people that live in the visual setting of a proposed wind farm. The view or scenery that is part of the everyday visual amenity of the home, is more sensitive to change than one that is not part of that setting.

Put another way, an anecdotal observation is that any one person could as part of the larger community, appreciate a wind farm as part of a rural landscape, when seen as part of a trip or even a pleasure drive. That same person may not be appreciative of the same development within the immediate view setting of their rural residence. Again this is totally understandable in terms of visual amenity as it relates to the impersonal appreciation of landscape as a small part of a sequential landscape when seen as a traveller, as apposed to the personal appreciation of landscape when seen as a much greater part of a limited landscape view shed from ones home.

In relation to both the broader community and the 'affected' local community, the awareness of environmental benefits can be a motivator in terms of increasing acceptance of a wind farm. This motivation was seen to be persuasive in relation to the broader community, but perhaps would not be as affective in relation to residents that live close to the wind farm.

Keeping in mind general observations on perception, Visual Sensitivity has been determined in relation to land use activity and distance of wind farm elements from viewer locations as outline in section 2.7 of this report.

On this basis the visual sensitivity of various viewing locations are illustrated in figure 7.1.

To enable a collective consideration of factors contributing to visual impact, visual sensitivity of various viewing locations is addressed in section 8 Visual Impacts along with a more detailed consideration of visual effects.

7.3 Visibility

The visibility of the Kyoto Energy Park is related for the greater part to the wind turbines at both the Mountain Station and Middlebrook Station Sites. The visibility is determined for the greater

part by topography, which has been the basis for defining the zones of visual influence illustrated in Figure 6.1.

It should be realised that there are a range of other factors that effect visibility. They include foreground elements such as vegetation and buildings that block view lines to the wind farm elements.

These factors have not been mapped. However it can be seen that the ZVI map illustrates 100% visibility of the wind turbines from all parts of Scone. While the wind turbines are visible in part from some locations of Scone, foreground vegetation and or buildings often block views to the distant mountains that support the wind farm elements.

Bearing this in mind, the major visibility to both the Mountain Station and Middlebrook wind farm sites is from the east, where the open valley allows for long views from many highway locations, rural areas and from some town areas, including Scone and Aberdeen.

High visibility also exists in the enclosed valleys of Middle Brook and Thompsons Creek with somewhat reduced visibility in Dart Brook and Keirnans/Sparkes Creeks.

Views from the west are more restricted with views generally from ridge top and east facing high elevation areas. In this sector a series of wooded ridges that separate Gibbergunyah, Cuan and Wybong Creeks and their tributaries, reduce visibility in this sector.

7.4 High Sensitivity Locations

Urban and Rural Residences

Residences by definition use landscape amenity as part of the setting of the house as part of a garden or house visual setting for passive recreational enjoyment.

The highest visual sensitivity viewing locations are private residences both urban and rural.

A potentially high visual sensitivity for residences will be experienced for distances up to 7.5km from the wind turbines. This will include many rural residences west of the New England Highway as well as Parkville.

In this context all houses are given a high visual sensitivity up to 7.5km away and a moderate sensitivity for houses 7.5 – 12.5 km away. Based on sensitivity levels illustrated in figure 2.6 and graphically illustrated in 7.1, this is a general rating that cannot be improved upon at this level of study. However on a house to house basis further consideration of the significance of a view affected by wind farm components can be determined by considering the position of the turbines in relation to primary, secondary and tertiary view zones around the house, see Figure 2.7. This consideration should be used in determining the applicability of visual mitigation strategies.

The Primary view zone of a house is that view that relates to the living and entertaining areas around a house. This includes lounge rooms, family rooms and in some cases kitchen/dining rooms as well as outdoor areas such as patios, verandah view or sitting locations, bbq areas, swimming pools, etc. Detail site inspection and view analysis will illustrate how significantly a view that may include the wind farm is to residences. Large picture windows or outdoor areas that are specifically orientated to a view should be given a higher sensitivity status than a house with a similar position but little evidence of strong architectural and landscape treatment to take in a view.

Secondary view zones would include bedrooms and other secondary rooms. However positive view orientation and treatment of views from these rooms or outdoor areas would indicate a high use level of that view.

Tertiary view zones would include bathrooms, toilets, laundry, outdoor work or storage areas. These areas would have little use for visual amenity as it relates to associated activities.

Walking Trails in National Parks and Reserves

It is noted that there are a number of National Parks and Reserves close to Middlebrook Station Site. If the wind turbines elements were seen from these locations from designated trails or lookouts from closer than 2.5km away the visual sensitivity would be high. However this sensitivity may be reduced due to the environmental perception of national park users and their understanding of the clean energy that wind farms produce.

It is understood, from the Community Information Day, that there are a number of informal trails and lookouts exist from which the wind turbines could be seen. These would rate as moderate to low sensitivities depending on distance. These could have a high sensitivity, however as above, this perception could be tempered by the knowledge of the benefit of wind farm elements in terms of climate change. Further when viewed from the park they would be seen for the greater part as part of a rural setting that would be seen in the background of wind farm elements.

7.5 Moderate Sensitivity

Scone

The urban areas of Scone, including Figtree Estates and new residential areas to the west of Scone and those to the east are within the 7.5km – 12.5km distance band and have a moderate visual sensitivity due to the distance from the wind turbines.

With the exception of parts of the new western subdivision there are not many parts of Scone that have a strong visual orientation towards wind farm areas.

Residences between 7.5km and 12.5km

The visual sensitivity of these residences is decreased from high to moderate due to the distances from the wind turbines. Visual orientation of house views etc would reduce this sensitivity to low depending on the degree of visibility and significance of such views from the house. For example many houses in Scone would have limited visibility.

Walking Trails in National Parks and Reserves

It is noted that there are a number of National Parks and Reserves close to Middlebrook Station Site. If the wind turbines were seen from these locations from designated trails or lookouts 2.5 – 7.5km away the visual sensitivity would be moderate.

Again in this distance range there is likely to be a number of informal walk trails and lookouts from which the wind turbines can be seen. However given the distance and the rural contexts that would background the turbines it is considered that a moderate sensitivity level would be experienced.

New England Highway

The highway in the vicinity of Parkville is less than 7.5km away and is designated a low to moderate sensitivity at this distance.

Major Local Roads, Bunnan Road

A moderate sensitivity is experienced from Bunnan Road locations that are closer than 2.5km. Past this distance a low sensitivity is experienced.

7.6 Low Sensitivities

Aberdeen and Muswellbrook

The townships of Aberdeen and Muswellbrook are over 15km away from the closest turbines and therefore experience a low visual sensitivity.

Rural Residences

At increased distances of over 12.5 km the visual sensitivity of residences reduces to low.

New England Highway

The highway with the exception of a small section around Parkville is further than 7.5km away from the wind turbines and experiences a low sensitivity. The lower sensitivity of the highway compared to other land use areas reflects the transient and ever changing view, the speed of travel and the potential interest value of a wind farm in a long road journey.

Minor Rural Roads

Beyond 2.5km views from minor roadways have been ascribed a low sensitivity.

Rural Areas

Rural working areas are designated a low visual sensitivity as visual amenity is not a functional adjunct to the land use activity of such lands.

7.7 Summary

There is a full spectrum of visual sensitivities within the primary visual catchment of the Kyoto Energy Park based on land use and distance. The most sensitive receptors are the rural residences that are in relatively close proximity to the wind turbines components of the proposal. Due to the scale of these elements, the methodology states that this high sensitivity is maintained up to 7.5km away from the nearest turbine. Beyond this residential sensitivity decreases to moderate. Within this 7.5 km range, numerous rural residences along Thompsons, Sharpes and Kiernans Creeks as well as Middle Brook and Dart Brook as well as along roads such as Moobi, Nandowra and Cliftlands Roads, will have a high sensitivity.

The townships of Scone, Aberdeen, Parkville and the more distant Muswellbrook are at distances greater than 10km from the wind turbines and have moderate to low sensitivity.

The national park areas to the north of Middlebrook would have high sensitivity from formal facilities but only moderate sensitivity from informal trails. These sensitivity levels may be moderated by the knowledge of the climate change benefits of the wind farm.

8.0 VISUAL IMPACT

In the first instance for a visual impact to occur, the wind turbines have to be visible. This visibility, based on topography alone has been mapped on to Zones of Visual Influence (ZVI) maps, Figures 6.1. These maps illustrate the visibility of the turbines elements on the Mountain Station site and the Middlebrook Station site.

It should be noted that in some cases it is not possible to take in the view of both sites in the same view. This is generally the case for locations between the two sites and for close up views from areas such as Thompsons Creek, parts of Dart Brook Road, etc. However in these cases, wind turbines on both sites remain visible in different views.

For areas that have visibility to the wind farm sites, a visual impact will be experienced. Visual Impact is a straight measure of a joint consideration of visual effects, figure 6.6 and visual sensitivity figure 7.1 considered together according to relationships defined in the study methodology, figure 2.8. The visual impacts of the energy park development are illustrated in figure 8.1 and are discussed below in relation to the various view zones around the wind farm.

If any land use types have not been mapped or discussed the visual effect, visual sensitivity and visual impact levels that apply are as indicated in figure 2.4 for visual effect, figure 2.6 for visual sensitivity and figure 2.8 for visual impact.

8.1 North Sector

Visibility
The north sector is dominated by the enclosed valleys of Middlebrook, north of Cressfield Road and the upper reaches of Thompsons Creek.

The ZVI illustrates the visibility of the wind turbines from these upper valley reaches. There are many areas that are unsighted but others have a range of visibilities based on topography alone. Review of aerial photography illustrates a great deal of vegetation that would, in certain instances decrease the visibility of turbines elements from these areas.

This section of Thompsons Creek valley has one residence. There are four houses located in the upper reaches of Middle Brook north of Cressfield Road. These residences would have potential views to both Middlebrook and Mountain Stations. Beyond the rural areas there are the Towarri National Park and Wingen Maid Nature Reserve. There is a camping area in Middle Brook but this is in the unsighted valley area. The national park does not have developed walking trails and lookouts within the vicinity however there would be locations from which the wind turbines would be seen, such as ridge top locations, informal trails and rock platforms that are not adjoined by foreground vegetation that would screen such views.

Sensitivity

The visual sensitivity of this sector is generally low given its dominant rural land use. National Park views are considered to have a moderate to low sensitivity due to the broader community understanding of the clean energy outcomes of wind farms, the smaller percentage of the primary view zone occupied by the wind farm and the transient nature of viewing.

There is some potential for high sensitivity in National Park areas immediately adjacent to the wind turbines, but again an understanding of the wind farm elements and its environmental benefit in terms of climate change should decrease this.

The homesteads are further than 2.5km away from the nearest turbine. The visual sensitivity would be high if in the primary view zone of the homestead and moderate if in the secondary or tertiary view zones of the house.

Visual Effect

As seen from this sector the wind turbines on Middlebrook and Mountain Station would have a spread of 6.13km.

The visual effect levels of the wind turbines on this sector have been calculated according to data sets in figure 6.2 and are geographically illustrated in Figure 6.6.

A review of Figure 6.6 illustrates that there are a limited number of houses that are exposed to 100% of the wind turbines with some houses experiencing lower exposure.

For those houses with views to 100%.

A High visual effect will be experienced up to 5.5km away with an area of greater than 5% of a primary view zone influenced by wind turbines elements.

A Moderate visual effect will be experienced up to 8.5 km away with turbines influencing between 2.5 and 5% of the primary view and

A Low visual effect will be experienced beyond this with turbines elements influencing less than 2.5% of a primary view zone.

Most houses in Upper Thompsons Creek Road are closer than 5.5km, see Figure 6.6 and therefore experience a high visual effect.

Visual Impact

The visual impact of the wind turbines is generally low to moderate. The exception is for the limited number of houses in Thompson Creek Road and Middle Brook Road. The visual impact would be high on residences closer than 5.5km due to high to moderate sensitivity and high visual effect, if the wind turbines are visible. This would apply to houses in Thompsons Creek Road.

There is potentially a high visual impact on national park areas within 2.5km range of the wind turbines. However the lack of formal facilities, tree cover and an appreciation of the environmental benefits of the turbines may mitigate this impact level.

8.2 North East Sector

Visibility

The north east sector contains parts of the New England Highway, the village of Wingen and a limited number of rural homesteads west of the highway and generally along Middlebrook Road and Cressfield Road.

The ZVI, see Figure 6.1 illustrates that the main areas of visibility are the open valley floor adjacent to the highway that allows for both wind turbines to be fully seen. In hilly areas closer to Middlebrook visibility is reduced by as much as 60%, due to topographic screening.

As with other locations visibility or lack of it from any given view point is dependant on foreground screening created by adjoining buildings, vegetation and or topography.

Sensitivity

The visual sensitivity of the broad acre is low. However homesteads in the sector would have a moderate to high sensitivity up to 7.5 km and a moderate to low sensitivity past this point.

Wingen would have a moderate to low sensitivity to the wind turbine elements at this distance.

The sensitivity of the highway and Great Northern Railway Line is low.

Visual Effects

As seen from this sector the wind turbines on Middlebrook and Mountain Station would have a spread of 8.8 km.

The visual effect of the wind turbines on this sector is illustrated on figure 6.3 and has been calculated according to data sets illustrated geographically in figure 6.6.

The visual effect of the wind turbines on this sector has been geographically illustrated in Figure 6.6. In this figure it can be seen that the exposure varies between 40% for residences close to Middlebrook to 100% for residences further away.

In this context:

Areas and residences with 40% or less exposure

- High visual effect on the houses adjacent to Middle Brook up to 2.5km away, despite the fact that only 40% can be seen.
- A moderate visual effect will be experienced by houses in Dry Creek with only 40% visibility up to a distance of 4km
- A Low visual effect will be experienced by houses on the northern slopes of Middlebrook Hill and south of Cressfield Road with only 40% visibility

Areas and residences with 100% exposure

- A high visual effect will be experienced closer than 5.5km. There appear to be two residences within this area. The visual effect will be similar to that experienced in Thompsons Creek Road (see 6.15)
- A moderate visual effect will be experienced between 5.5 and 10km. Most of the residences adjacent to Cressfield Road and the highway would be within this range
- A low visual effect will be experienced beyond 10km

Visual Impact

The visual impact on this sector is generally moderate to low.

The exceptions are rural residences west of the highway and adjacent to Cressfield and Middlebrook Road that could experience where a moderate to high visual effect is experienced and a high sensitivity inside the 7.5km range. To some degree this high visual impact depending on visual orientation and the influence of any foreground screening.

8.3 East Sector

Visibility
This is perhaps the most critical view sector. It contains the highest number of sensitive visual receptors and includes:

- Scone and Parkville
- Rural residences and roads west of highway but south of Yarrandi Road
- Yarrandi and Bunnan Roads and rural residences on these roads
- Middlebrook Road, Cressfield Road and part of Wallington Road
- New England Highway

Scone and Parkville

The Urban Areas of Scone generally have a western aspect. This is especially the case for the new subdivision adjacent to Dodd Street/Gundy Road, see Figure 6.12. This area has strong Primary view orientation to the west towards Mountain Station and to the south down the valley. There are many east west streets that give long views onto Mountain Station; less so do north south streets give views to Middlebrook. In this context many areas of Scone are unsighted because of foreground screening created by urban development and vegetation within the streetscape or adjacent private property areas.

Similarly Parkville, on the basis of topography alone, has open views to both wind farm sites. As with Scone only foreground vegetation and or housing development screen the wind turbines from view.

Rural residences and roads west of highway but south of Yarrandi Road

Rural residences on Roads between the New England Highway and Mountain Station, eg Invermein Rd, Cliftlands Rd, Alan Cunningham Road and Moobi Road, see Figure 6.10 that generally have views to Mountain Station and Middlebrook. However the visual orientation of primary views from these houses to either of these hill sites is generally limited and not in the primary view zone, however there would be exceptions. The wind turbines would be visible from some house areas and from garden views.

It is also the case that in most situations both wind farm sites would be visible but not always in the same view. This is due to the relative locations of the wind farm sites in relation to viewing points. Mountain Station is to the east and Middlebrook is to the N.N.E.

In the same way the wind farms will be visible from the rural roads in this sector especially those heading west along Bunnan Rd, Yarrandi Rd and Dartbrook Rd. These roads are generally in open rural landscapes where there is little foreground screening to filter views to the wind farm areas.

Rural residences on these roads are in part between the two wind farms so that views to the north take in Middlebrook and views to the south Mountain Station. Views are over open rural lands and views from residences depend on orientation and foreground vegetation.

Middlebrook Road, Cressfield Road and part of Walington Road

These roads and adjoining residences are adjacent to the Middlebrook Station wind farm site. Views directly west would only take in Middlebrook Station. These views would be similar to those experienced in Thompsons Creek, see figure 6.15. South westerly views would take in Mountain Station.

In relation to a primary view only one wind farm site can be part of the view from most sites. By far the most visible and intimate to this location is the Middlebrook Station site.

Highway

There are views from the highway, especially travelling south with more open views to Mountain Station, see Figure 6.13, with Middlebrook Station being screened to some extent by an intervening hill and vegetation.

Sensitivity

The visual sensitivity of this sector is the highest as it contains the greatest number of urban and rural residences.

For rural homes closer than 7.5km high or moderate sensitivity will result from the visual orientation of the homestead to the wind turbines and the location of the turbines in the primary, secondary or tertiary view zones of the house.

For Scone the visual sensitivity is moderate to low depending on the visual orientation of the house and visibility.

In this sector the highway and main railway line have a low sensitivity except for a short distance where these major travel corridors are less than 7.5km away from Middlebrook Station, resulting in a moderate visual sensitivity.

Visual Effect

As seen from this sector the wind turbines on Middlebrook and Mountain Station would have a spread of 13km with a 4.5km gap between the two sites.

The visual effect levels of the wind turbines on this sector based on visual exposure levels are determined in accordance with calculations illustrated in figure 6.4 and has been illustrated geographically in figure 6.6. It can be seen from Figure 6.6 that for the greater part the wind farm has 80% to 100% exposure with small areas within the Middle Brook area having 20-60% exposure.

In this sector for areas with 80% to 100% of the turbines seen, the visual effect levels are as follows:

- High visual effect will be experienced up to 4.5km to 5.5 km away with more than 5% of the primary view zone occupied by wind turbine.
- Moderate visual effect from between 4.4 to 5.5km and 9 to 10km away with between 2.5 and 5% of the primary view zone influenced by wind turbines.
- Low visual effect beyond 9-10km

Visual Impact

The visual impact on rural residences closer than 7.5km will have a high visual impact, based on high visual effects and high to moderate visual sensitivity.

Past this point a moderate to low visual impact is experienced by rural residences.

The visual impact on Scone is moderate depending on visual orientation of residences to the wind turbine sites. This reflects the moderate sensitivity and moderate to low visual effects. The impact on main street commercial properties is low.

The visual impact on the New England Highway is low.

8.4 South East Sector

The south east sector contains a number of rural residences as well as the township of Aberdeen, Muswellbrook and a significant length of the New England Highway and rural roads.

Views from this sector are generally open, unless there is mitigating foreground buildings or vegetation and would take in both wind farms as part of a primary view in that direction.

From North Muswellbrook some residences could have views to the wind turbine areas but these are distant and generally only of Mountain Station.

Aberdeen similarly generally has potential views over Mountain Station due to the topography of the town area.

The New England Highway has potential views to parts of the wind farm areas from as far away as Lake Liddell. From this point and from subsequent high points up to just north of Muswellbrook views may be obtained over intervening topography. From this point on more open views are obtained from various low points including the bridge to the north of Aberdeen. After Halcombe Hill open views are continuous, see Figure 6.11 and take in both Mountain Station and Middlebrook.

Initially Middlebrook Station is not on the skyline. However as one progresses north, back grounding hills decrease in significance and by Scone, Middlebrook is on the skyline.

Sensitivity

The visual sensitivity of rural residences in this sector is the same as for other sectors defined above and range from high to low depending on distance from Mountain Station. High to moderate sensitivity will be experienced up to a distance of 7.5 km depending on visual orientation and visual exposure to wind turbine elements. Past this distance a moderate to low sensitivity is experienced to 12.5km, with low sensitivity beyond this distance.

The visual sensitivity of the townships of Aberdeen and Muswellbrook is considered to be low given the 20-30km distance of these towns from the wind turbine elements.

A low sensitivity is experienced by roads in the sector, including the New England Highway and Northern Railway Line.

Visual Effect

As seen from this sector the wind turbines on Middlebrook and Mountain Station would have a spread of 6.14km.

The visual effect levels of the wind turbines on this sector have been calculated as per data set out in figure 6.5 and has been illustrated geographically in figure 6.6.

As can be seen in Figure 6.6 by far the greatest exposure level in this sector is 100% due to the open valley foreground of most viewing locations in this sector. However some of the more critical and closer rural residences only experience 80% exposure.

At these levels of exposure:

- A high visual effect will be experienced up to distances of 4km for 80% exposure and 5.5 km for 100% exposure
- A moderate visual effect will be experienced from 4-5.5km to 7.5-8km
- A low visual effect being experienced beyond 7.5-8km

Visual Impact

The visual impact on this sector is generally low with the exception of some rural residences within 7.5km of the wind turbines. Beyond this distance the visual impact is reduced by the significant distances that the wind turbines may be seen from valley locations.

8.5 South

Visibility

The southern areas are dominated by the hills of which the Mountain Station is a part. There is also limited visibility in this sector with views restricted to the ridge and spurs south of the site, see Figure 6.1.

There are some 18 houses in areas with restricted views of between 20-100%.

A small number of residences in the vicinity of "East Rossgale", that are on the ridge top areas that would have 100% views to the wind turbine sites, some 6kms away.

Other areas below the escarpment at Rossgale lookout are generally unsighted, with the lookout generally looking south down the valley.

Sensitivity

The sensitivity of this sector is generally low. The exceptions are the views from some houses in the Rossgale area.

Visual Effect

As for the north sector the wind turbines on Middlebrook and Mountain Station would have a spread of 6.13km as seen from this sector.

The visual effect of the wind turbines on this sector is determined according to distance and percentage of the wind turbines seen according to data sets in figure 6.2 and has been illustrated geographically in figure 6.6.

In this sector there are significant areas unsighted, but those that have exposure have 80% to 100% exposure.

At these levels of exposure:

- A High visual effect will be experienced up to 5.5km away
- Moderate visual effects will be experienced up to 8km away with

- Low effects beyond 8km

The visual effect of the wind turbines on the residences at this distance would be high up to a distance of 8km due to the proximity of the turbines.

Visual Impact

The visual impact on this sector is generally low due to limited visibility from sensitive view locations.

The exception is a few residences in the vicinity of Rossgale Road on the escarpment to the south of Mountain Station that would experience a high impact.

8.6 South West

Visibility

This sector is dominated by rolling wooded hills with only hill top areas having some views to the wind turbine elements. These areas do not support residences with most homesteads in this sector being in the valleys along Wybong and Cuan Creeks.

The wind turbines, especially those on Mountain Station will be visible to parts of the Bunnan Road on an easterly journey, see Figure 6.17 and to more distant rural residences located in upper slope areas. However most of these are further than 12.5km away from the wind turbine areas.

Sensitivity

The sensitivity of this sector is low as all rural homesteads are generally along the creek bottoms and are unsighted.

The Bunnan Road also has a low sensitivity.

Visual Effect

As seen from this sector the wind turbines on Middlebrook and Mountain Station would have a spread of 8.8 km.

The visual effect of the wind turbines on this sector are calculated in figure 6.3 and have been illustrated geographically in figure 6.6.

The visual effect of the wind farm on this sector is high up to a distance of 6km when all the wind turbines are seen. However generally only Mountain Station is seen from this location and only 50% of turbines are seen in any view reducing high visual effects at approximately 3km.

Visual Impact

The visual impact is generally low due to low sensitivities and lower visibility levels from Bunnan Road. A review of the ZVI at Figure 6.1 illustrates the unsighting of most rural homesteads in this location. Sighted homesteads with full views are generally outside the 12.5km range.

8.7 Western Sector

Visibility
The western sector consists of two parts. That which is to the west of Mountain Station and that which is to the west of Middlebrook.

The part west of Mountain Station contains the village of Bunnan as well as a number of rural residences. However the rural residences for the greater part are low in the landscape along various creeks in the sector including: Gibbergunyah, Cuan and Wybong Creeks. This with some exceptions, see Figure 6.17, intervening ridges un-sight the residences in these valley locations from wind turbines . The village of Bunnan is similarly unsighted.

Exceptions may be some houses in the vicinity of Owens Gap. In this location from 16 -21 turbines are sighted on the basis of topography alone. However foreground vegetation may screen some or all of these turbines from various locations.

The exception to the normal pattern of residences occurring on the creek flats occurs at Clifton Hills Estate along Bunnan Road, see Figure 6.16. Here a new rural residential subdivision is located on a ridge top location and has visibility to some wind turbine areas.

The part west of Middlebrook Station includes Thompson Creek, see Figure 6.15, and parts of the Dart brook Road up to the Sparkes Creek turn off. The major visual exposure to residences in this locality is to the Middlebrook Station Site; however in a southerly direction views to Mountain Station are also available.

Sensitivity

The sensitivity of the northern part of the western sector is high due to the residences in Thompson and Sparkes Creek as well as along Dart Brook and their proximity to Middlebrook.

In the southern part of this sector hills and forest cover limit views to Mountain Station and only a few homesteads at Owens Gap would have a high sensitivity.

A new rural subdivision at Clifton Hills Estate has to be ascribed a high sensitivity due to intended land use. However as only a single residence has been built they should be able to avoid having primary views orientated to Mountain Station. But some blocks may have house views to the north towards Middlebrook.

Visual Effect

As seen from this sector the wind turbines on Middlebrook and Mountain Station would have a spread of 13.2km with a 4.5km gap between the two sites.

The visual effects of the wind turbines on this sector have been calculated in figure 6.4 and have been illustrated geographically in figure 6.6.

A high visual effect would be experienced up to distances of 6km if all turbines can be seen. This reduces to 2-4km as fewer turbines (40%) are seen.

On this basis the visual effect on Owens Gap would be high. The visual effect on Clifton Hills Estate is high to moderate, based on the 20-40% visibility.

Visual Impact

The visual impact on houses in near by creeks, especially Thompsons Creek will be high if the wind turbine sites are within the primary or secondary views of homesteads.

Similarly if seen from houses at Owens Gap a high visual impact will be experienced if the wind turbines are in the primary view zone. This is based on moderate visual effects and high sensitivity.

The rural residential development at Clifton Hills Estate will experience a high tending towards moderate impact due to the limited number of turbines that will be visible and the ability to orientate houses to avoid views to the turbines.

8.8 North West Sector

Visibility

The Upper parts of Thompsons Creek, Sparkes Creek, Kiernans Creek and Upper part of Dart Brook are within this sector.

The one house in Thompsons Creek within this locality is within the northern sector but is to the NW of Middlebrook and it is exposed to wind turbines of both Middlebrook and Mountain Station.

The upper valley reaches of Sparkes Creek and Keirnans are generally screened to Middlebrook but potential views down the valley to parts of Mountain Station are possible. Hill top and upper slope areas may have views to both sites, especially those with an easterly aspect. Residences adjacent to these creeks are limited and are generally lower in the valley or adjacent to Dart brook Road.

The Upper Reaches of Dart Brook have increasingly restricted views to Mountain Station but retain views to Middlebrook.

Sensitivity

The area as a whole has low sensitivity except for rural homesteads in the area that have views to either Middlebrook Station or Mountain Station sites.

A high sensitivity is experienced by houses at the lower end of Sparkes Creek. The remainder have moderate to low sensitivity.

Depending on visibility and view orientation a high or medium sensitivity will be experienced.

Visual Effect

As seen from this sector the wind turbines on Middlebrook and Mountain Station would have a spread of 6.14km.

The visual effect of the wind turbines on this sector are calculated in figure 6.5 and has been illustrated geographically in figure 6.6.

The visual effect in this sector is affected by limited visibility to the total array of wind turbines with general visibility at 60% or less. This gives the locality a visual effect level of high up to 3.5km and moderate visual effect up to 6km away.

Visual Impact

The visual impact in this sector is generally low with homesteads experiencing a potentially high impact if closer than 6km with a moderate to low impact past this point.

8.9 The Mid Sector

Visibility

This sector occurs in the middle of the other sectors and is the area that is geographically in the rural areas between the two wind arms on Middlebrook and Mountain Stations.

These areas are dominated by open rural lands and have high visibility to both wind turbine sites. They have views to Middlebrook to the north and Mountain Station to the south but generally not in the same view.

Sensitivity

All the homesteads in this area have a high sensitivity due to their proximity to the wind farm. Roads in this sector have a low sensitivity.

Visual Effects

The visual effect levels would be similar for those in the north or south sectors and are high at these distances.

Visual Impact

Visual impacts for rural residences in this sector are high. The visual impact on roads is moderate.

8.10 Impact Summary

The visual impact of the Kyoto Energy Park is for the greater part created by the wind turbines. The visual impact assessment above has therefore focused on this development component of the energy park.

All other components, solar PV Plant, Visitors and Education Centre, substation, access roads, etc generally have low visual impacts. This is due to the limited vertical scale and the ability of the existing landscape and any subsequent planting to screen or visually integrate these elements into the landscape. The impact of the transmission line will be moderate to low, given its alignment along and replacement of an existing power line with resultant moderate to low visual effects and impacts.

The wind turbines by virtue of their scale and location in the landscape create strong contrast and lack visual integration creating strong visual effects. These visual effects are only lessened as the scale of the wind turbines are reduced and are seen in the contexts of much larger visual settings. This occurs when the turbines components of the energy park are seen from more distant locations and depends on what percentage of the turbines that are seen.

The high visual effect levels when combined with high visual sensitivity, primarily from residential viewing locations creates potentially high visual impacts for those residences that have a strong visual orientation towards the wind farm areas and slightly less for those that do not have this visual orientation.

The most highly impacted view locations are the rural residences in close proximity and those that are within small scale landscape and visual settings. This visual condition is created in locations such as Thompsons Creek Road and to a lesser extent along Parts of Middlebrook Road. Here intimate valley views are to varying extents dominated by ridge top wind farm components.

This condition is to some extent less critical to the east of Mountain Station where there is a much broader valley and the scale of visual settings is much greater. Also the visual orientation of homes is less likely to be towards the topographic feature that is Mountain Station. However there will be exceptions.

The visual impact on Scone is generally moderate reflecting moderate visual effects and sensitivities at this distance. The impacts on the more distant towns of Aberdeen and Muswellbrook will be low.

The visual impact on the highway and railway is generally low and is likely to be a visual feature in an ever changing view as seen from these travel corridors.

9.0 VISUAL AMELIORATION TREATMENTS

The major visual impacts created by the Kyoto Energy Park are created by the wind turbines in the project. Because of the scale of the wind turbines, visual treatments to reduce sensitivity (visibility) and visual effect (visual integration) need to be done at or close to the viewing locations. Visual treatments of other components of the Energy Park can be completed at the site.

The full range of visual treatments for various elements is outlined below under the various development elements. These treatments should be further developed as part of detail design.

9.1 Wind Turbines

Landscape Conservation Zones

Mountain Station is outside defined landscape conservation areas.

However the Middlebrook turbines are within a range of visual settings that include Castle Rock that has a local heritage rating, is within a 7(a) zoning and does have distinctive landscape character values.

In consideration of these matters it is considered that the fewer turbines that are built on Middlebrook the better for the visual setting of Castle Rock and its distinctive landscape setting. As a minimum visual consideration the two turbines closest to Castle Rock (as originally proposed) should not be constructed. It should be noted that in response to such consideration, the turbine closest to Castle Rock has already been removed and the second closest turbine has been relocated east of the Castle Rock plateau. This spur to Castle Rock is of primary significance, however the Glen Range in the locality is also important, with the range north of the intersection with the Castle Rock Spur and the drop of to the south also being important, While the remaining ridge line is of less importance, it still contributes to the visual setting of Castle Rock.

Colour

Colour of the wind farm elements is the only practical consideration for treatment on site.
Often there is consideration given to different colours and or combinations of them. All colour combinations have positive and negative attributes as the sky of which the turbines are a visual attribute is constantly changing its visual qualities. In this context the off – white that is often used is the best in the context of all conditions.

However softer light greys or soft grey greens may also be appropriate.

However it must be stated that colour will generally not influence the levels of contrast or integration and therefore unless there is a desire to make a strong visual statement, the neutral colours of off white or soft grey are preferred, see Figure 9.1.

Planting

Planting can provide visual screening or integration to wind turbines from any view point, see Figure 9.2. In this context highly impacted homesteads should be treated to achieve this screening/integration treatment.

It should be noted that such treatment need not delete any 'landscape' component but rather create a vegetation filter to that part of the skyscape that is affected by the wind farm.

Technical assistance through workshops is recommended with planting assistance in highly impacted properties are recommended.

Treatments should consider:

- Integration and or screen planting at homesteads that have primary view impacted and that experience high visual impact.
- Complementary landscape treatments for worst affected homesteads generally in Thompson Creek Road, Lower Sparkes Creek, Dart Brook Road and Middlebrook Road areas.

- Complementary landscape treatments of homesteads in areas affected in vicinity of Moobi Roads as well as adjacent roads.

9.2 Solar PV Plant

The solar PV plant considers 4 options for solar configurations including fixed or rotating axes (Options 1 to 3) which vary between 1.5m to 4m above ground level or a Concentrating Solar Power (CSP) dish configuration which has a maximum height of 14m above ground level. It is recommended that if Option 4 is selected (i.e. CSP dish) then a setback to the Mt Moobi escarpment of 50m be implemented to minimise views to them form valley areas to the east.

In all options there should be a visual buffer on the eastern escarpment to screen them from view. Such planting should consist of a minimum of 5 rows of indigenous trees and tall shrubs with species dependent on overall height of final structure.

9.3 Mini-hydro Plant

This plant is well integrated and screened from external view. Care should be taken in minimising clearing of overtopping trees when constructing the water pipe lines down the hill. Holding tanks and associated facilities should be coloured olive green to minimise colour contrast.

As required provide screen planting to header tanks and upper sections of water race pipelines.

9.4 Access Roads

Generally roads will not be visible to surrounding areas and will generally require upgrading of existing roads and tracks. Treatments will aim at reducing visual contrast and scale of the roadways. Specific recommendations include:

- Roads and construction tracks are where possible to use existing trails
- New trails and roadways should avoid tree clearing to utilise tree canopy for screening purposes
- Route selection to minimize views on to road, giving special care in relation to potential views from locations parallel to the road alignment
- Minimise straight alignments and follow contour of land
- Design of road batters to maximize integration
- Design consideration for road down sizing and or restoration after construction

9.5 Buildings and Substation

Buildings and the substation have small vertical and horizontal scale and can easily be integrated using the existing landscape as well as supplementary planting.

Treatments will aim at increasing site integration.

- The Managers residence is to have a maximum height of 8m. The Visitors and Education Centre is to have a maximum height of 6m.
- Building roof to create overhang to create shadow effect on external walls
- Design and colouring of building elements to achieve minimum contrast with existing colours of receiving landscape
- Painting with environmentally compatible colours with variety to assist in visually modulating building
- Siting to maximise visual integration using existing landform and vegetation
- Supplementary planting to provide integration elements both in front of and behind built form elements
- Such design should be applied to all buildings on both the eastern escarpment and on areas adjacent to Bunnan Road

9.6 Transmission Line

Treatments will aim at increasing visual integration and decreasing visibility to sensitive viewing locations.

- Old poles with cross arms supporting insulators to be replaced with simple pole structures with cantilevered insulators to accommodate new circuits
- Existing distribution circuits are to be placed on new transmission line poles
- Structure coloured with new light green colouring used in lower hunter valley areas on concrete poles
- At viewer location integration planting as needed in special need locations such as highly effected rural homesteads
- Alignments within town settings and approaches should receive supplementary planting with suitable trees to achieve visual integration of the transmission line structures.

10.0 CONCLUSION

The Kyoto Energy Park is an exciting clean energy generating facility delivering energy to the community from 100% renewable sources. In addition to providing clean energy for the locality, the Energy Park creates tourist and educational potentials that could further benefit local economies.

The Energy Park consists of elements that will harness wind, solar and gravity as sources of clean energy. While all of these elements and associated facilities such as buildings and a transmission line have a visual effect by far the biggest visual effect and potential impact will be created by the wind turbines.

The wind farm elements of the project were considered in terms of the landscape interactions created by them and the visual effects and impacts resulting on surrounding visual receptors as set out in the Director General's Requirements (May 2007), in accordance with the The Australian Wind Energy Association (Auswind) and the Australian Council of National Trusts guidelines in : *Wind Farms and Landscape Values, Foundation Report*, *Final Version, 27June 2007(Auswind 2007).*

In terms of visual interactions with the existing landscape, Mountain Station is more typical and common of rural landscapes within the Australian context. But even this locality has distinctive qualities created by major rock outcropping, when viewed in certain local contexts.

However Middlebrook has high landscape integrity and has recognised distinctive landscape qualities, especially as they relate to Castle Rock. In the context of Middlebrook the less turbines constructed within the visual setting of the Castle Rock the higher will be the retained integrity of the Rock and its distinctive landscape setting.

The visual impacts of the wind farm elements on various view locations were the greatest on near by rural residences adjacent to both Middlebrook and Mountain Station. It is recommended that the highly impacted locations be treated with screening and integration plantings to lessen visual effects and visibility levels.

With sensitive treatment of onsite developments and intelligent interpretation of the various components of the Energy Park the project as a whole within the constraints noted above has the potential to be an appropriately integrated to achieve the much needed clean energy outcomes for the location.

It is understood that the visual perception of wind farms can be positive because of their visual strength and environmental values in terms of clean energy. However in this visual study, a high visual sensitivity for residences, urban and rural has been assumed. On this basis the visual impacts of the Kyoto Energy Park is mainly experienced by adjoining residents that to varying degrees are impacted by the view of wind turbines.

Due to the siting of the wind farm components on the two sites, with the exception of the rural residences within Thompsons Creek and Middle Brook and to a lesser extent areas adjoining Mountain Station Valley, most residential development is more distant with the towns being from 10-30km away.

High visual impact areas are restricted to rural residential areas most notably in the Thompsons Creek Valley, Middle Brook and Dart Brook as well as, to varied degrees, the areas east of Mountain Station.

In these instances, working with affected communities, it is intended to carry out planting design workshops and in the case of highly impacted residences to eliminate views to the Kyoto Energy Park or to visually integrate the wind turbines by providing foreground visual frames and or filters of foreground vegetation.

In the most highly affected areas it is intended to carry out 'compensatory landscape' works as needed to integrate or screen wind turbines, re-orientate views and or create new visual/garden focus.

By using foreground treatments and by providing 'compensatory landscape' visual effects will be reduced thereby lowering the visual impacts levels of the wind turbines.

By mitigating the visual impacts of the wind turbines of the Kyoto Energy Park on affected locals, the environmental benefit of the development can be realised.