

KAIMAI WIND FARM

Assessment of Environmental Effects Summary Document



19 November 2018

Introduction

Kaimai Wind Farm Limited (“KWF”) seeks to establish a wind farm at the north-western end of the Kaimai Ranges, located in the Waikato Region of New Zealand’s upper North Island. The proposed project involves 24 large scale wind turbines up to 207m high (to rotor tip), designed and located through an iterative process over several years across a site comprising 771 and 604 Rotokohu Road and 6356 State Highway 26 – with a combined site area of 1304 hectares. The wind farm will have an installed capacity of approximately 100MW and an expected annual output of 400GWh.

Ancillary structures and works are also required, including a new 110kV sub-station with two new lattice transmission towers, two internal 33kV overhead lines, 18.9km of internal/access roading network, 24 turbine platforms, 3 component laydown areas, replacement of existing culverts along the site access of Wright Road, and an underground cable network between the turbines. A comprehensive mitigation package is also proposed, including ecological, visual, cultural, traffic and landscape measures.

Resource consent applications have been lodged and include both land use consents for discretionary activities from the Hauraki District Council (“HDC”), and from the Waikato Regional Council, again as discretionary activities, for the proposed upgrades to existing in-stream culverts, earthworks, and associated discharges to land and water. The project also involves limited works within the Matamata-Piako District Council’s (“MPDC”) district, to construct some of the access to the wind farm, and ancillary works. The works undertaken within the MPDC area can be undertaken as Permitted Activities in accordance with the provisions of the Matamata-Piako District Plan.

An Assessment of Environmental Effects (“AEE”) has been lodged with the respective Councils and details the results of the various technical investigations, as set out in the reports lodged with the AEE. The conclusions in these reports are summarised below. The AEE and the full reports can be accessed on the HDC website at <http://www.hauraki-dc.govt.nz/services/resource-consents/kaimai-wind-farm-project/>

The Applicant

The applicant is KWF, which is a wholly owned subsidiary of Ventus Energy (NZ) Ltd (“Ventus”) which is in turn owned by Glenn Starr. Mr Starr also owns Ventus Energy Ltd, a company incorporated in the Republic of Ireland which has developed two wind farms in the west of Ireland at 6MW and 24MW. Ventus Energy (NZ) Ltd (Ventus) holds consents for an 11-turbine project on the west coast of the North Island, south of Kawhia Harbour named Taumatotara.

The Site

The Site for the proposed wind farm occupies land held by three (3) separate landowners, including the site access of Wrights Road. The total area is 1304 Ha.

The site is described in the AEE and in further detail in the technical reports included in the application. Figures 1 and 2 below show the site location, and the proposed layout of the wind farm.

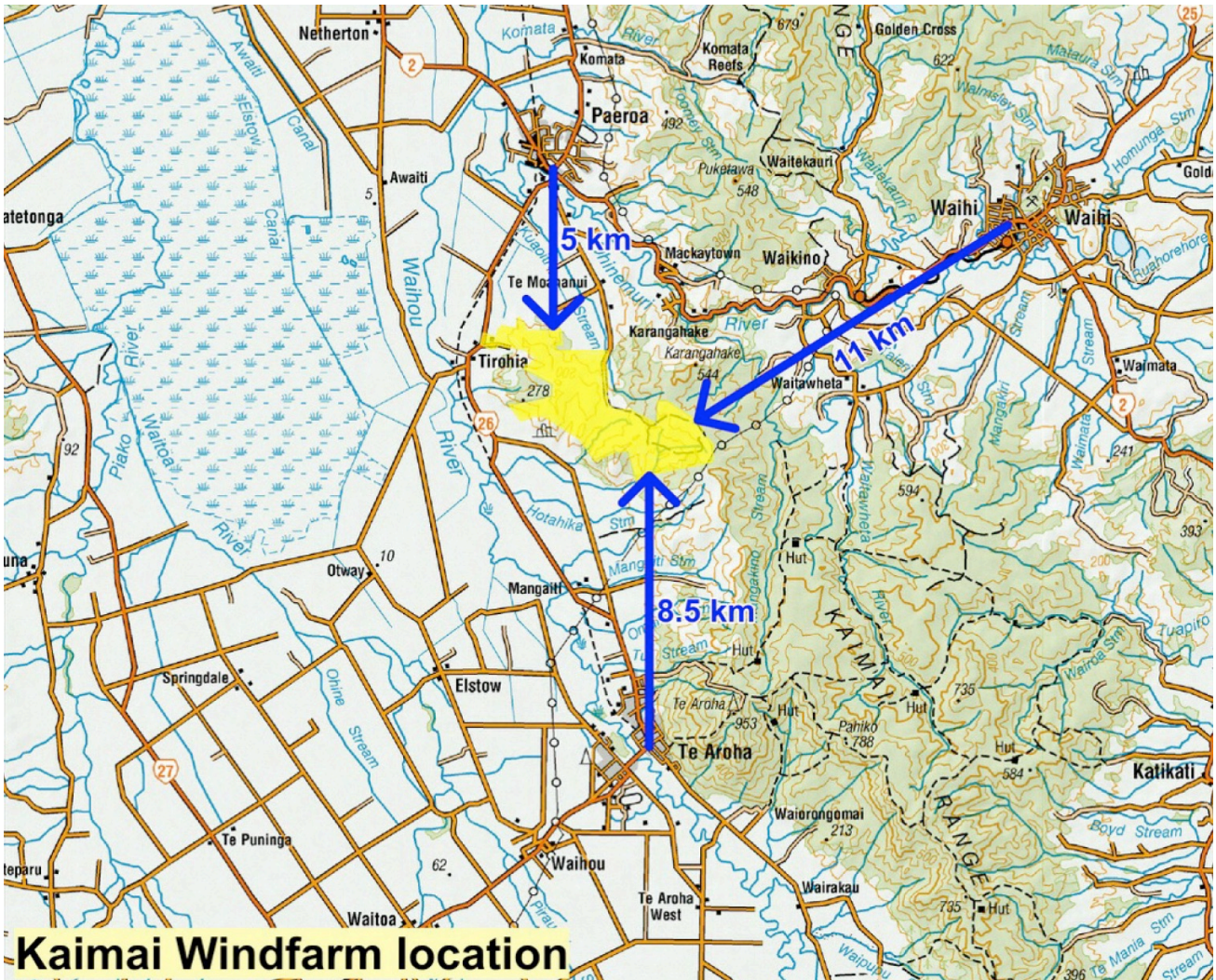


Figure 1. Site Location Map

The Proposal

The Project will introduce seven 180m high turbines to the main Kaimai Range ridgeline (turbine numbers 18 – 24), and seventeen 207m high turbines at the lower elevation ridgeline – refer to Figure 2 below. The overall height of each turbine is measured to the vertical blade tip, and represents a combination of the tower height, hub diameter and blade length.

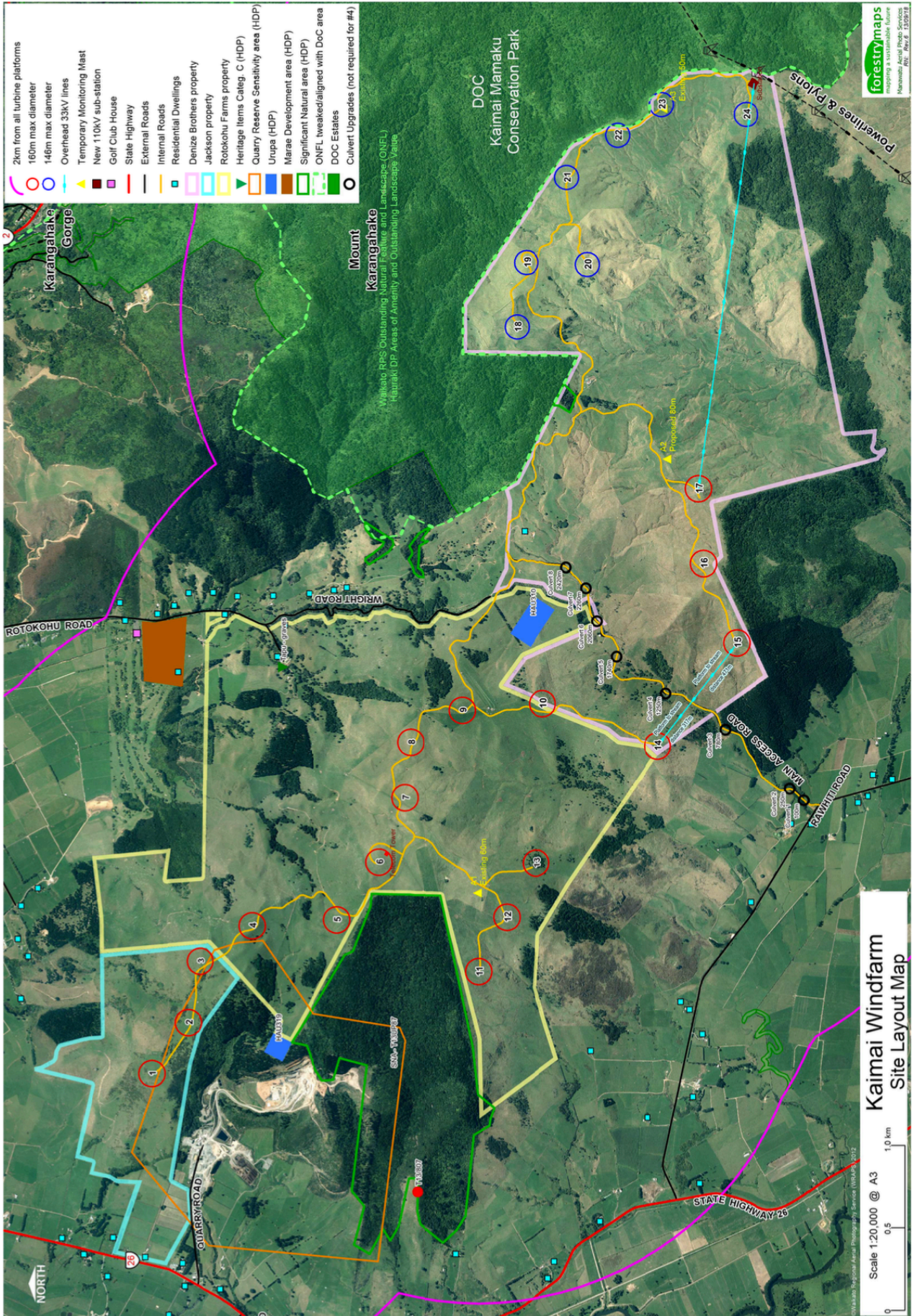


Figure 2. Proposed Site Layout and Features Map (Rev. 6 dated 13/09/2018)

The Proposal (continued)

The following ancillary structures and works are required to facilitate the construction, operation and ongoing maintenance of the wind farm:

- A new sub-station is proposed to be constructed on site that will facilitate connection into the existing National Grid via a 110kV network, located at the south-eastern end of the site. In tandem, two new lattice transmission towers will be required to enable this connection.
- Construction of two internal 33kV overhead lines including double pole termination structures. The wind farm layout has resulted in three clusters of turbines (aligning with distinct ridgeline areas) and rather than install underground cable between these three clusters, it is more efficient to install overhead lines to connect the first two clusters into the proposed sub-station.
- 18.9km of internal/access roading network. The road, including 900m of access road leading into the site, mostly follows existing farm access tracks (except for the access road from Rawhiti Road) and ridgelines where the greatest wind resource exists. The road will typically be 6m wide on straight sections and wider on corners. Surface water drainage is to be managed by cross-fall gradients, roadside collection channels and culverts.
- Twenty-four (24) turbine platforms including crane pad and (in most cases) turbine component laydown / storage areas. As a conservative approach the preliminary civil design has allowed for a 26 x 26m octagonal gravity type foundation. This foundation size is evidenced overseas where these larger turbines are now being installed. The crane pad will hold the mobile crane required to lift the nacelles (housing the generator components) to a hub height of 132m. The laydown / storage areas (where possible) are sized to allow the laydown of three blades.
- Three turbine component laydown and construction equipment storage areas. These areas allow for storage of turbine components, contractor machinery, site offices and fuel. Any fuel stored in these areas will be contained in a fully bunded and purpose-built storage facility. Any turbine lubrication fluid or transformer fluid will also be contained in a fully bunded temporary facility.
- Replacement of culverts along the existing site access of Wrights Road to allow the passage of a higher rainfall event and to provide for heavy loads.
- An underground 33kV cable network is to be installed (by specialist pipe laying machinery) to collect the electrical output from each turbine.
- Earthworks estimated at 596,500m² in area, with a total cut volume of 900,000m³. Of this total cut volume, 113,500m³ will be placed as engineered fill along the road alignment, and the balance of 786,500m³ will be placed on site in specific suitable cleanfill disposal areas. These values were revised through the Section 92 response process.
- The road formation will require a large volume of aggregate to enable the aggregate pavement construction, which will either be won from roading excavations or a small quarry on site.
- The necessary separation distances between turbines has resulted in Turbine 13 being located on an isolated area of undesignated and degrading indigenous forest within the Site. This area is described by Ecology New Zealand Ltd as a contiguous podocarp-broadleaf treeland, and the proposed area of clearance is estimated at approximately 1,700m² out of the 1.15ha bush fragment.

Site Selection

Ventus has had an active program of investigating wind farm generation opportunities throughout the upper North Island. Ventus has used both traditional site assessment methods and modelling techniques to identify potential wind farm sites. The investigation of the wind resource at several sites throughout New Zealand has formed the basis for Ventus' consideration in determining general and specific areas that may be viable for the development of utility scale wind farms. This analysis has identified the Kaimai Range area as being the most suitable site in the region for wind farm development.

As part of the selection process for a potential site several technical matters relative to different sites are evaluated. While every potential location for a wind farm has its individual nuances, it is generally accepted that a site which has the collective following attributes will be a suitable candidate for wind generation at a commercial scale:

- Availability of a good wind resource (typically an average annual wind speed greater than 7.5 m/s, ideally associated with low turbulence);
- Availability of land suitable for the construction of turbines;
- Close proximity to locations of high energy demand;
- Suitable distance from large population centres;
- Practical access for transporting equipment and materials to the site;
- Ability to connect to the national grid; and
- Avoidance of sensitive environmental areas.

KWF has considered each of these matters in detail when selecting the Kaimai site as a feasible development project. The main determinant for locating a wind farm in the upper North Island is the distance of a site with a viable wind resource to the Transpower network.

TRANSPOWER TRANSMISSION NETWORK : NORTH ISLAND

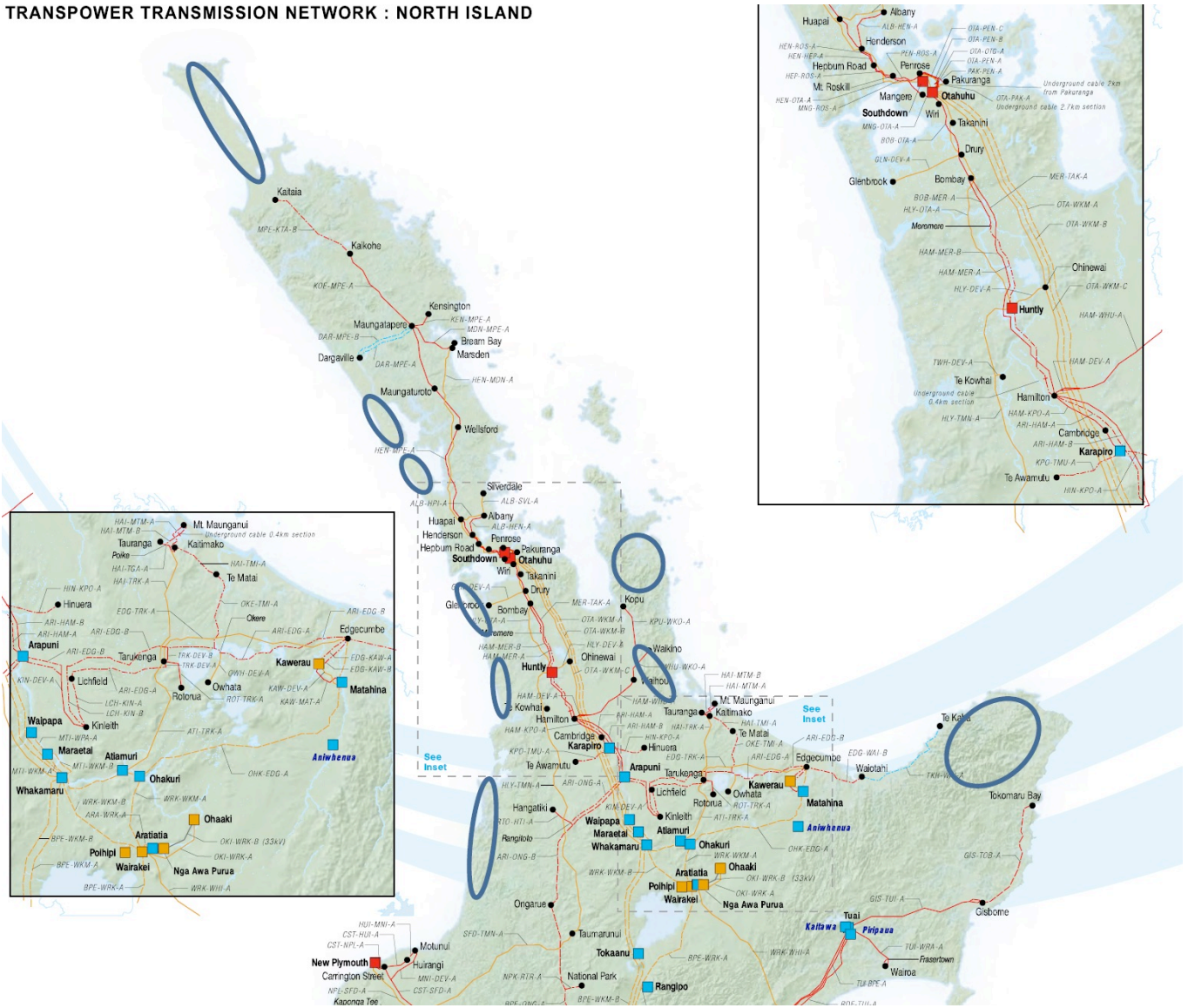


Figure 3. Map showing viable wind resource areas in the upper North Island and National Grid

Referring to Figure 3 above, the locations of viable wind resources are shown by the purple oval shapes, and the Transpower National Grid network is shown by orange and red lines. It is apparent that most good wind resource areas are in coastal environments a long distance from the Transpower network. As a result, to develop a project at scale in the upper North Island requires a supporting grid corridor. This forms three major constraints to successful development:

1. Consenting a transmission corridor
2. Obtaining the legal right to occupy the land
3. The overall grid connection costs typically render even a large-scale wind energy project financially unviable.

The KWF Site is unique in the Upper North Island as it is the only viable site co-incident with a Transpower connection point. The Site has a significant development advantage in this respect, with the Transpower 110kV Line passing directly along the southern boundary.

KWF will have installed capacity of circa 100MW, and an expected annual production level of circa 400GWh. Of this, the output of 144GWh/annum achieved from the seven 180m turbines in the upper ridge area where wind speeds are higher, enables project viability at commercial scale.

The Effects of the Proposal

As noted above, the AEE has been informed by numerous technical assessments undertaken by experts in their respective fields, commensurate with the significance of this wind farm Project, and in respect of both the construction and operational phases of the Project. The conclusions below are extracts from the AEE. Further detailed analysis of the effects can be obtained within the AEE and technical reports, which can be accessed on the HDC website at <http://www.hauraki-dc.govt.nz/services/resource-consents/kaimai-wind-farm-project/>

Surrounding Character, Landscape and Visual Effects

An assessment of the actual and potential effects of the wind farm on the landscape, visual amenity and character of the surrounding environment has been undertaken by Mike Moore, a registered landscape architect with the New Zealand Institute of Landscape Architects, and his assessment references Project photomontages completed by Energy3.

In summary, Mr Moore concludes that Project will cause ‘adverse / high’ effects on the landscape character and values as a result of the upper group of 7 turbines, and ‘adverse / moderate’ effects for the main lower group of turbines. Mr Moore explains that the variation in effects relates to the differing character and sensitivity of the contexts for the two groups. As to visual amenity effects on the various affected viewing audiences, the assessments range from ‘adverse / high’ to ‘adverse / very low’ levels of effect. Mr Moore determines that the visual amenity effects are likely to be most pronounced on close-by residents, while viewpoints to the east of the Ranges will also be more significantly impacted due to the highly natural landscape context associated with the Outstanding Natural Features and Landscapes (ONFL).

While Mr Moore’s report has concluded that there would be up to ‘adverse / high’ effects on landscape character and values and visual amenity in this area, it is not possible for a wind farm to avoid adverse visual effects, given the necessary scale and positioning of turbines along ridges to efficiently and economically utilise the available wind resource. Wind farms are also not foreign elements in the rural landscape and they require the space and scale provided by rural settings.

Wind farm design is largely dictated by operational requirements, including the location and number of turbines required for a viable scheme. With the Kaimai Wind Farm, several design iterations have been undertaken with the intent of mitigating adverse effects on the landscape, where possible. This has included removing two turbines (with nine turbines originally planned along the upper ridgeline) and reducing the height of the seven turbines on the upper ridge to a maximum tip height of 180m. As mitigation for the seven upper turbines, KWF is now also proposing to retire from stock and plant approximately 23.5ha of the land sloping towards the Kaimai Mamaku Conservation Park in native vegetation (i.e. adjacent to turbines 18-21). Revegetation of the eastern slopes will occur so that there is eventually no pasture visible from eastern viewpoints and this will reduce the adverse landscape effects in that area to moderate – high in the long term. On this basis, the Kaimai Wind Farm in its proposed format is considered to represent an appropriate and balanced outcome in terms of effects on landscape values, character and visibility.

Visual simulations of the turbines from 20 representative locations, including from areas in close proximity to the wind farm site, have been prepared and are available on request, but can also be viewed on the HDC website <http://www.hauraki-dc.govt.nz/services/resource-consents/kaimai-wind-farm-project/>

Noise and Vibration.

An acoustic assessment has been undertaken by Dr Stephen Chiles of Chiles Ltd to determine the predicted noise levels from the wind farm, in particular to address potential ongoing noise levels from the operation of the wind farm relative to the nearest residences. Dr Chiles has also assessed the potential noise effects associated with the construction of the Project.

The noise and vibration assessment of the Project has been completed in accordance with current best practice, and specifically the requirements of the New Zealand Standard on Acoustics – Wind Farm Noise (NZS 6808: 2010). The assessment concludes that all requirements of NZS 6808: 2010 will be met by the Project. In particular, the wind farm sound levels are predicted to comply with a 40 dB LA90 noise limit at the closest houses to the windfarm site. This noise level, established under NZS 6808, is set specifically to protect health and reasonable amenity. Vibration from wind farms has been shown to be below thresholds for levels that can be felt by people or cause damage to buildings. Dr Chiles concludes that the noise effects of the Kaimai Wind Farm are considered to be acceptable in this environment. Further, KWF proposes to implement the conditions of consent recommended by Chiles Ltd to ensure noise effects remain in accordance with that assessment (this includes complying with recommended construction noise and District Plan standards).

Ecological Effects

An assessment of the potential ecological effects associated with the construction and operation of the wind farm has been undertaken by Kessels Ecology Ltd, which is summarised through its ‘Ecological Effects Assessment’ report dated March 2018 following extensive investigations undertaken from 2009 to 2017. Supplementary ecological investigations were commissioned by KWF to ensure a comprehensive ecological assessment of the Project, and these have been undertaken by Ecology New Zealand Limited (ENZL).

The Site contains areas of indigenous forest and scrubland, most of which is avoided by the wind farm design. The Hauraki District Plan (“HDP”) identified Significant Natural Area (“SNA”) is specifically avoided. However, Turbine 13 is proposed to be located on a fragment area of indigenous vegetation, requiring vegetation clearance of 1657m² of “secondary broadleaved forest” and 70m² of “secondary broadleaved treeland” for its construction and operation. No further indigenous vegetation will be removed for the construction of infrastructure and roading upgrades to the wind farm. The ecological assessments conclude that non-significant effects are expected from the abovementioned clearance of vegetation.

Both the Kessels and ENZL assessments address potential effects on bats, and in particular, local long-tailed bat populations. Long-tailed bat threat status was described in the Kessels EEA report as Nationally Vulnerable. The threat status of this species has been updated and it is now classified as a Threatened – Nationally Critical species. Both Kessels and ENZL confirm the presence of long-tailed bats in and around the Project area. Both assessments indicate some risk to this species from the operation of the wind farm; however a comprehensive multi-year bat strike monitoring programme gained from the Te Uku Wind Farm in Raglan (a wind farm of similar scale and habitat matrix) provides a strong indication that the actual impact of wind farms on long-tailed bats is not significant. The proposed mitigation measures in the form of targeted pest control to address the residual risk to long-tailed bats, as proposed through the Kessels analysis and endorsed in the ENZL assessment, is considered appropriate relative to the scale of potential adverse effects.

The potential effects on avifauna (birds) from the Project have been investigated and assessed through the Kessels assessment, with supplementary commentary provided through the ENZL report, particularly in respect of appropriate mitigation measures. The main risk posed to resident and migrating birds is blade strike. The Kessels assessment concluded that collision risk analysis and carcass search studies under operating windfarms in New Zealand have indicated that actual strike is rarely detected and where it occurs is

in low numbers which local populations are able to sustain. Migrating birds between the Firth of Thames and the Bay of Plenty pass over the site (detected from surveys) and other migratory birds are likely to be using flight pathways across the Kaimai Range (despite not being detected in surveys). Previous studies suggest that strike mortality will be low and able to be mitigated through appropriate offset (fencing, habitat restoration and animal pest control), monitoring and adaptive management, as proposed by KWF.

Most of the vegetation within the Site and Project envelope is comprised of pasture and no significant indigenous vegetation will be directly affected by the development. This reduces the scope for adverse ecological effects on herpetofauna (lizards) and indigenous terrestrial invertebrates. There is potential for habitat disturbance through the clearance and/or trimming of non-ecologically significant vegetation (comprising of both exotic and indigenous species), primarily associated with the establishment of Turbine 13 as well as earthworks. The ENZL report concludes that areas on the site contain relict populations of copper skink. Without mitigation, it is likely that the proposed vegetation clearance and earthworks will adversely affect native lizards (e.g., by causing injury, death or displacement) and the review recommends that prior to any vegetation clearance and earthworks, an appropriately qualified and DOC-approved herpetologist/ecologist should implement appropriate lizard management prior to and during vegetation removal and earthworks, which KWF agrees to implement.

In terms of effects to aquatic habitat, both ecological reports conclude that the earthworks and culvert upgrades can be appropriately mitigated through the implementation of the proposed best practice measures throughout the duration of the construction works. The ENZL assessment further addresses the effects associated with the in-stream culvert upgrades and considers that these have the potential to increase the ecological value of the site by improving fish passage through the site, ensuring that previously restricted habitat become accessible.

The supplementary ecological assessment undertaken by ENZL presents a summary table of the potential residual ecological effects associated with the project after recommended management has been implemented. This table is included as follows:

Key Ecological Values	Risk Assessment	Predicted significance of residual adverse effects following implementation of avoidance, mitigation and compensation measures
Vegetation	Localised vegetation clearance to occur for the establishment of a single Turbine footprint	Non-significant effects expected
Long-tailed bats	Localised vegetation clearance and potential collision risks may impact bats but monitoring at operational wind farms indicates little or no impact on bats.	Non-significant effects expected but with uncertainty. Monitoring and adaptive management to be applied accordingly.
Internal Migratory Avifauna (Waders)	Flight paths may cross the site. South Island Pied oystercatcher have been detected flying over the site but in low numbers	Non-significant effects expected but with uncertainty. Monitoring and adaptive management to be applied accordingly.
Northern Hemisphere Avifauna Migrants	Migration pathway(s) may cross the site. Bioacoustic surveys will be carried out during migration periods to reduce uncertainty.	Non-significant effects expected but with some uncertainty. Monitoring and possibly adaptive management/compensation to be applied accordingly.

Key Ecological Values	Risk Assessment	Predicted significance of residual adverse effects following implementation of avoidance, mitigation and compensation measures
Resident Avifauna	Resident native birds (e.g., tui, harrier and kereru, are likely to be present in low numbers. Monitoring at operational wind farm sites indicate very low actual strike rates.	Non-significant effects expected
Local Avifauna Migrants	Collision may occur during dispersal or localised migration by NZ falcons and North Island kaka, but likely to be rare event	Non-significant effects expected but with uncertainty. Monitoring and adaptive management to be applied accordingly.
Herpetofauna	Localised in areas of vegetation rank grass clearance	Non-significant effects expected
Terrestrial Invertebrates	Low – Negligible localised impacts expected for individuals/local populations.	Non-significant effects expected
Freshwater Quality (including aquatic invertebrates)	Sediment and erosion from construction pose risks to entering the sites waterways.	Non-significant effects expected
Freshwater Quality (including aquatic invertebrates)	Sediment and erosion from construction pose risks to entering the sites waterways.	Non-significant effects expected
Native Fish	Localised impacts at eight culvert sites across the site.	Non-significant effects expected
Environmental Weeds	Potential spread and introduction of weeds during the construction and operations phase.	Non-significant effects expected
Disease Spread	Potential spread and introduction of disease during the construction and operations phase.	Non-significant effects expected

Table 1. Summary Table of the Potential Ecological Effects after implementing recommended management (ENZL report)

Shadow Flicker

‘Shadow Flicker’ refers to the shadow that a wind turbine casts over structures and observers when the sun is positioned behind the turbine rotor. An analysis of the potential shadow flicker effects has been undertaken by Energy3 Services Ltd and the report presents an assessment of the potential occurrence of shadow flicker on 39 dwellings near the wind farm. The assessment considered the dwellings within 2km of the wind farm for the total number of hours per year that these dwelling could potentially be exposed to shadow flicker. The generally accepted international exposure levels are deemed as 30 hours in total per year on a modelled basis, 10 hours per year actually experienced, or no more than 30 minutes per day. The number of occupied residences registering more than 30 hours per year was 15, ranging from 30.1 hours to 92.6 hours. Calculations were assessed a conservative basis, assuming all houses had an un-obscured window directly orientated towards the wind farm.

Energy3 have also outlined mitigation measures that could be explored in the event that shadow flicker is a nuisance on nearby residences. These include planting vegetation or tree lines that will obscure the line of sight to the turbines causing flicker; and the installation of window blinds or awnings on affected dwellings.

KWF is open to providing practicable planting on site for local residents in response to adverse effects from shadow flicker. Overall and on balance, the potential adverse effects from shadow flicker can be appropriately mitigated.

Tourism and Recreation

The turbines are to be located within private land; however, the location is adjacent to various recreational and tourism activity sites that have the potential to be affected by the wind farm. An assessment of the actual and potential effects of the development on tourism and recreation values has been undertaken by TRC Tourism Ltd. Overall, TRC Tourism Ltd have concluded in their assessment that potential social, recreation and tourism effects arising from the construction of the wind farm will be minimal and can be appropriately managed. In terms of the operational effects, the wind farm will be noticed, but will not restrict public access or prevent enjoyment of the nearby recreational and tourism facilities. On this basis, the Kaimai Wind Farm will reasonably integrate within the surrounding recreational and tourism activities with minimal adverse impacts. There is also an opportunity to make a positive contribution to local tourism through a series of initiatives designed to inform the local community and visitors to the region about the wind farm and its function.

Geotechnical Effects

A geotechnical assessment has been undertaken by KGA Geotechnical Ltd (KGA) relative to the specific ground conditions at the Site, and to assess the potential for geotechnical constraints and inform the preliminary design of the Kaimai Wind Farm. KGA provides recommendations for detailed earthworks, turbine foundation and building design/construction, access design/construction, and drainage considerations, but ultimately concludes no significant geotechnical issues would prevent the safe formation of the Project on the Site.

Site Access and Transport

A report has been prepared by Tranzcarr Heavy Haulage Limited outlining the expected land transportation options and routes for transporting the turbine components and equipment to the Project Site. The report focuses on two aspects of the transportation: the oversize loads being blade sections which are up to 78m in length, and the heaviest loads – being the nacelles, generator or the blades (up to 85 tonnes in weight). The Tranzcarr report provides some certainty that transportation of the turbine equipment to the site is feasible, albeit with the necessary input and approvals from the transport authorities and potential modifications along the route from Port of Tauranga to the Site.

The main access to the wind farm for turbine components is on Rawhiti Road, which is located within the MPDC district. A traffic assessment has been prepared by Gray Matter Limited which considers the potential safety and efficiency effects on the transport network associated with the construction and establishment of the wind farm. The proposal is likely to generate approximately 104 vehicles per day (vpd) with peaks up to around double that (218 vpd) for a short duration of 18 months while the wind farm is developed. Thereafter traffic movements will be negligible (1-2 vpd). Access to the wind farm for construction and operation can be adequately and safely achieved and any increased traffic generation from the project can be adequately accommodated within the existing traffic network. Any adverse traffic effects can be appropriately mitigated by recommended measures in the Integrated Traffic Assessment (“ITA”) – including localised road widening and the requirement for a specific traffic construction management plan.

Discharges to Land and Water

Earthworks and stream works

The earthworks required to enable the construction of the wind farm, primarily related to the access and turbine platforms, are extensive in scale. The land disturbance activities will also include an aggregate extraction (“quarry”) operation at a defined location on the site. The Wright Road access to the site will involve some upgrades/replacements of existing culverts, which are located within watercourses.

The potential for soil erosion and discharges of sediment-laden water during the earthworks was assessed by Civil Engineering Services (“CES”) who prepared a preliminary erosion and sediment control plan to support the consent application. In response to Council’s Section 92 request for further information, KWF commissioned an additional assessment by a leading expert in sediment and erosion control for major development projects, to recommend further best practice measures for adoption in consent conditions. This led to a comprehensive and supplementary erosion and sediment control plan prepared by Ridley Dunphy Environmental Limited (“RDEL”), which further addresses the effects associated with the bulk earthworks, aggregate extraction operation and the culvert replacements. The following table, extracted from the RDEL assessment, outlines the key parameters for the earthworks that are required to implement the project.

Key Project Parameter	2DArea / Volumes / Discussion
Area of Earthworks for Road	266,000 m ² (26.6ha)
Area of Earthworks for Fill Sites	212,500 m ² (21.2ha)
Area of Earthworks for Turbine Establishment Including turbine platforms, substation platform, transmission tower(s), and assembly area	95,000 m ² (9.5ha)
Other Earthworks Including potential road corner widening, turning areas and quarry area	23,300 m ² (23.3ha)
Total Earthworks over 25 degrees	Up to 10 ha of area as identified in the plans within Appendix A
Total Combined Earthworks Area	596,500 m ² (59.6ha)
Total Cut Volume of Earthworks	900,000 m ³
Total Fill Volume of Earthworks (excluding Fill Sites)	113,500 m ³
Total Fill Volume of Earthworks for Fill Sites	786,500 m ³
Length of New Road	8,200 m
Length of Road to be Upgraded	10,700 m
Number of Turbine Platforms	24

Table 2. Key Earthworks Parameters (RDEL Report)

The RDEL assessment outlines various construction methodologies and erosion and sediment controls which are to be implemented for the duration of works to minimise sediment runoff from the Site into the receiving environment. The works will involve a range of devices and methodologies, including but not limited to, sediment retention ponds, decanting earth bunds, clean water diversions, staging and sequencing of earthworks to minimise exposed areas, progressive stabilisation of completed areas and stabilised entrance ways. The methodologies for the construction of the culverts is also outlined in the RDEL report, and these

will be confirmed by way of site-specific erosion and sediment control plans, prior to any works being undertaken. However, RDEL have assessed the appropriateness of the methodologies and consider that the likely key methodology for these works within watercourses will be a dam and pump process.

The report confirms that erosion and sediment controls can be effectively employed for the construction phase of developing the wind farm, and with a robust construction methodology along with continued management, monitoring and reporting of sediment controls and methodologies, any sediment related runoff to receiving environments will be minimised.

Stormwater from roads

The management of stormwater from the road alignment and cross-road culverts has also been subject to assessment by CES. This assessment undertaken by CES concludes that 'the existing culverts and concreted overflow spillways serve the farm access and potentially the wind farm quite adequately barring the need to improve the geometric aspects of the road.' The proposed culvert improvement measures will be implemented as per the CES Report, and stormwater from the proposed road will be managed in accordance with best practice. Overall, the potential effects of discharges to land and water associated with stormwater from the road alignment will be appropriately managed and mitigated.

Archaeological and Heritage

The project Site is recorded with NZAA as containing one archaeological site, being T13/923 relating to gold prospecting which is recorded as an archaeological Sensitive Area (A) on historic maps. Under the HDP maps, two wāhi tapu sites are registered within the project envelope (HAU 310 and HAU 319). The project has the potential to disturb, modify and destroy these archaeological and heritage sites, particularly during the construction phase of the project. An archaeological assessment has been undertaken by Andrew Hoffman to assess the potential and actual effects of the wind farm on these archaeological and heritage values. Mr Hoffman's assessment demonstrates that none of the known or probable heritage features on the Site will be affected by the Project. A consent condition will however be included to the effect that if unknown sites are discovered, work at that site will stop and the relevant iwi and other authorities notified.

Cultural Effects

The AEE outlines the consultation that has been undertaken to date. The responses to consultation with Hauraki iwi to date have been limited, but efforts at consultation continue. Ngāti Hako provided a summary Cultural Values Assessment in April 2018 which highlighted that the Kaimai Mamaku range is an area of high spiritual and cultural significance to Hako, and identified the following key issues:

- Ngāti Hako place high value on the cultural landscape of Hako and Hauraki. The wind turbines will affect the cultural landscape of Hako. The aesthetic value will be impeded and may have detrimental effects on the cultural values associated with the peaks and mountain ranges.
- There are potential effects on the tohu and kaitiaki located and associated with the Kaimai Mamaku mountain ranges. Tangata whenua rely on tohu (indicators) for weather, tangata (people) and whenua (land). These tohu have been a significant part of Ngāti Hako culture and traditions since time immemorial.
- For Ngāti Hako, te uira (lightning) ua (rain), and kohu (mist) are important tohu used to caution and notify iwi of impending news. The proposal will have potential effects on the weather patterns and our ability to read these tohu.

KWF continues to progress with further iwi consultation with a view to further cultural values assessments being prepared along with the publicly notified consent process to enable a fully informed decision to be made on these and other cultural issues of importance to iwi.

Aviation Effects

An assessment of the potential and actual effects of the proposal on aviation activities has been undertaken by Peet Aviation regarding the effects on activities such as hang-gliding, paragliding, as well as glider aircraft from the Matamata Soaring Centre. The conclusions by Peet Aviation are that the effects from the Project on aviation activities can be appropriately managed and mitigated by the recommended measures.

Radio Interference

Lambda Communications have undertaken an assessment to determine the effects that the construction of the wind farm might have on existing radio communications services in the area. The conclusion reached by Lambda Communications is that on balance, the effect of the Project on radio communications services will be minimal and, in most cases, there will be no impact at all.

Positive Effects

The proposed wind farm has the potential to generate numerous positive and economic benefits for local and regional communities, as well as New Zealand wide. This includes the following:

Generation Benefits – Renewable Electricity

- The use of renewable energy resources, effectively assisting in meeting the required targets under the National Policy Statement for Renewable Energy Generation (“NPS-REG”) (as addressed further below) .
- With an installed capacity of circa 100MW, this will put downward pressures on the wholesale electricity price in real time. An expected annual production level of circa 400GWh will be available to be sold forward into the contracts market. Therefore, the Kaimai Wind Farm will aid competition in the New Zealand Wholesale Electricity Markets having the ability to result in lower overall electricity prices for consumers in New Zealand.
- There are both National and Local benefits from a security of supply perspective to having the Kaimai Wind Farm consented and built. From a National supply perspective, there has been a decline in the supply and demand balance between 2010 and 2016, with more thermal plant retired than new plant built over that period. The Kaimai Wind Farm will reduce national security of supply risk. At a local level, it has been noted that there is a forecast thermal constraint and present voltage issues associated with the 110KV Valley Spur circuit. There is also strong demand growth (historic and forecasted) in areas fed by the Valley Spur circuit. Accordingly, another option will be added for the management of the thermal constraint and voltage issues. The Kaimai Wind Farm will be able to cover off 60% of expected future demand peaks.

NZ Economy Benefits

- The expected Full Time Equivalent (FTE) jobs for wind farms are reported by BERL in a report commissioned by the Wind Energy Association. The phases are as follows:
 - Planning/Design/Project Management: 0.81 FTE/MW – 81 FTE - estimated 18 months
 - Construction: 1.79 FTE/MW – 179 FTE – estimated 18 months
 - Operation: 0.15 FTE/MW – 15 FTE - estimated 30 years

- The expected capex of the project is \$180M, made up of Turbines, transport and balance of plant at \$126M, \$12.6M and \$41.4M respectively. The balance of plant will be sourced locally.

Renewable Energy Generation and Climate Change Mitigation Benefits

A fact sheet has been prepared by Electricity Risk Solutions Ltd (“ERS”) which provides some context and figures around how the KWF will contribute to high-level legislation, publications and targets for renewable energy generation, and its positive contributions to the reduction in Co2 emissions. The conclusions that are highlighted in the fact sheet have been summarised as follows:

- The NPS-REG requires new generation supply by 2026 to meet the 90% renewable generation target. It is expected that 37% of the target is forecast to come from Wind Generation. The Kaimai Wind Farm will contribute 11% of the required new wind supply requirements that is embedded within the NPSREG.
- The Transpower Security of Supply Assessment: Winter Energy Margin publication seeks to maintain a 15% supply margin over forecast demand. The base case scenario has 8,877GWh of new generation supply required by 2026. This is to ensure that there is an adequate level of generation supply to meet expected electricity demand for New Zealand during extended dry periods when hydro-electric generation in the South Island is constrained. An appraisal of the Kaimai Wind Farm against this publication demonstrates that the KWF will contribute 13.8% of the required new wind supply.
- The Ministry of Business, Innovation, and Employment; Average of Electricity Demand and Generation Scenarios (“EDGS”) are created to be used by Transpower and the Commerce Commission to assess future proposals for planning for capital investment in the transmission grid. The expected demand requires 14,000GWh of new generation supply by 2040 and it is forecast to be comprised of 43% wind energy. The Kaimai Wind Farm will contribute 7.8% of the required new wind supply.
- ERS has calculated the level of Co2 reduction that particularly arises from the retirement of thermal generation sources. This information is then used to calculate an average level of annual emission reduction that the Kaimai Wind Farm can provide with its renewable generation. The results indicate that the Kaimai Wind Farm annual generation would achieve a reduction in carbon emissions of circa 300Kt/Year across the three emission reduction profiles (NPSREG, EDGS and Te Mauri Hiko report). This is circa 5% of the 6,126Kt total reduction that could be achieved through 100% renewable electricity generation across NZ.

Overview of Proposed Mitigation Measures

KWF proposes the following broad mitigation programme to address residual adverse environmental effects of the 24-turbine project. KWF further intend that these measures will be refined through the consent process to specific conditions of consent.

- Local ecology (notably bush birds and bats): KWF will provide funds to support local restoration and rehabilitation projects. The KWF preference is for these funds to go towards supporting bat habitats or populations.
- KWF is proposing to revegetate into native species around 23 hectares of pasture in the vicinity of turbines 21 to 23 and adjacent to the Kaimai Forest Reserve. In the long term this will provide additional habitat for bird species as well as mitigate the landscape and visual effects from viewpoints to the east of the KWF site.

- Approximately one kilometre of the Waitoki Stream will be retired from stock, fenced and planted in native species to provide an improved habitat for fish and macroinvertebrate species in the stream. This will more than compensate for any effects of stream crossing works proposed.
- Migration Birds: KWF will offer to contribute to conservation management at the Miranda Shore Bird centre. The aim is to maintain or enhance that habitat and/or breeding success of water birds.
- Landscape and Visual – Local Residences Views: Vegetation and visual buffering in the intervening landscape is being explored to assist in screening the turbines from some closer residences. KWF is open to providing practicable planting on site for local residents.
- Landscape and Visual – Night Sky: KWF commits to using an active aviation light management system that activates only when approaching aircraft are detected in order to mitigate the effects of the turbine aviation lighting on the naturalness of the night sky.
- Tangata Whenua (Cultural) – Measures to remedy or offset effects of the Project on the cultural land-scape as valued by hapū with mana whenua standing, as may include, for example, funding of a local carving and story boards recognising the unique history of tangata whenua in this environment. The location and content of this shall be decided in consultation with the local Iwi and the Hauraki District Council.
- Tangata Whenua (Economic) – Further to those measures outlined above in respect of cultural values, KWF proposes an annual scholarship to support tertiary-level study in resource management, industrial design or engineering.
- Residences – A fund for supporting local social connectivity.
- Shadow flicker – Vegetation and visual buffering in the intervening landscape is being explored to assist in screening the turbines from some closer residences. KWF is open to providing practicable planting on site for local residents.
- Traffic – construction vehicles and heavy transporters will be limited to the Wright Road entrance.
- Tourism – Funding to support local tourism initiatives such as Hauraki Rail Trail, Karangahake trails, ecology tours etc
- Soarers (Gliders and Hang Gliders): Turbines 16 and 17 are to be shut down on up to ten (10) days per year that coincide with glider competitions and low wind speed conditions. A communication protocol shall be put in place to co-ordinate the wind farm operation with the soaring community.

Statutory Tests and Planning Documents

The AEE also contains an assessment of the Project against the statutory tests set by the Resource Management Act 1991 (“RMA”), and the relevant provisions of the national, regional and district policy statements and plans in particular.

By way of very brief summary of that assessment, it is considered the Project is generally consistent with, and not contrary to, the objectives and policies throughout relevant national, regional and district planning documents – including the NPS-REG, Waikato Regional Policy Statement, Waikato Regional Plan, Waikato Regional Energy Strategy, Hauraki District Plan, and the Zero Carbon Bill. Numerous provisions recognise the need to develop renewable electricity generation infrastructure, including at significant scale and the need for such infrastructure to be located where the resource exists. There is also clear policy recognition that the development of renewable electricity generation activities responds to technical, functional and locational constraints that must be considered in determining the appropriateness of a site for development.

In particular, the NPS-REG is of paramount importance to recognising renewable energy as a matter of national significance in its own right, and is the only national planning instrument of direct relevance to the Project, giving national direction as to how the Part 2 principles of the RMA should be applied in assessing it.

Conclusions

KWF proposes the establishment of 24 large scale wind turbines up to 207m high, designed through an iterative process over several years across a Site comprising 771 and 604 Rotokohu Road and 6356 State Highway 26 – with a combined site area of 1304 hectares. Ancillary structures and works are also required, including of a new 110kV sub-station with two new lattice transmission towers, two internal 33kV overhead lines, 18.9km of internal roading network, 24 turbine platforms, 3 component laydown areas, replacement of culverts along the existing farm access track, and an underground cable network between the turbines. A comprehensive mitigation package is also proposed, including ecological, visual, cultural, traffic and landscape measures. These will be refined through the consent process, and in response to ongoing consultation with stakeholders, building on the extensive consultation undertaken that has informed the overall proposal.

The Kaimai Wind Farm is a significant project – at a local, regional and national scale. The AEE prepared in support of the consent applications for the Project has been informed by numerous technical assessments undertaken by experts in their respective fields, commensurate with the significance of this Project, and in respect of both the construction and operational phases.

The AEE concludes that on balance the Kaimai Wind Farm has been designed, and can be constructed and operated in a manner that will appropriately avoid, remedy or mitigate adverse effects on the environment. The Site is considered to be an appropriate location for a wind farm, particularly given the immediate proximity to the National Grid and the accessibility of a strong wind resource, the rural zoning and pastoral land use, available noise buffer separation distances from residential dwellings, and a lack of designated ecological or landscape values within the Site.

That being said, it is recognised that the potential adverse effects from the Project cannot be avoided, remedied or mitigated in their entirety. The adverse impacts on landscape character and values and visual amenity in this area have the potential to be high, as do effects on the cultural landscape valued by tangata whenua. In this regard, the Kaimai Wind Farm has evolved through an iterative design process – seeking to address often conflicting values, and the proposal now represents an appropriate outcome in terms of effects on visibility and the surrounding landscape and character.

In summary, the AEE establishes that the proposed Kaimai Wind Farm achieves an appropriate balance in terms of its location and site design, and the actual and potential adverse effects from the Project can be appropriately mitigated or offset. Finally, the Project addresses the growing need for renewable energy generation and is in synergy with the statutory framework of relevance to this consent application.