

# Lake Turkana Wind Power Project

## Methodology for Ornithological Survey

16 August 2010



Prepared for  
**Aldwych International & LTWP**

## Revision Schedule

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Rev	Date	Details	Prepared by	Reviewed by	Approved by
01	20 <sup>th</sup> July 2010	DRAFT	<b>Kevin Du Rose</b> Ornithologist	<b>Mike Padfield</b> Senior Ecologist	<b>Russell Foxwell</b> Associate Director
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# 1 Introduction

- 1.1.1 The proposed Lake Turkana Wind Power Project (LTWP) is situated in the Marsabit district of northwest Kenya. The project aims to provide 300MW of wind energy for the national grid, via a series of 365 wind turbines.
- 1.1.2 The windfarm will be positioned within an overall project site of 24,000 acres (approximately 100km<sup>2</sup>), the turbines will be located at a distance of around 10km to the south east of the lake itself.
- 1.1.3 An Environmental Impact Assessment for the windfarm development has been prepared (*LTWP (2009) Lake Turkana Wind Power Project - Environmental and Social Impact Assessment Study Report July 2009*) and approved by Kenyan Government.
- 1.1.4 It has been recommended that a one-year programme of ornithological surveys is required to validate the conclusions of the ESIA prepared for the Project. Scott Wilson has been commissioned to develop a suitable method for these surveys.
- 1.1.5 This Report presents the draft bird survey monitoring method. It has been developed from the Scottish Natural Heritage survey methodology, (SNH (2005) *Bird survey methods for use in assessing the impacts of onshore wind farms on bird communities*), adapted to suit to the conditions at the project site. The methodology has been prepared following a four day site reconnaissance survey between 30<sup>th</sup> July and 2<sup>nd</sup> August 2010, in addition to local consultation. A summary of the results from this reconnaissance survey is included.
- 1.1.6 There are two main potential impacts on avifauna brought about by wind farms, these are i), the risk of collision, potentially from the less manoeuvrable species colliding with the wind turbines and ii) general bird avoidance of wind turbines meaning birds are excluded from otherwise suitable habitat within the vicinity of the wind farm.

Figure 1 – Location Map



## 2 Site Reconnaissance Survey

### Site Description

- 2.1.1 The wind farm site is approximately 100km<sup>2</sup> in size and comprises ‘masai xeric’<sup>1</sup> grassland and scrubland with areas of bare alluvial deposits. There are very few trees across the site and no permanent water bodies. Site photographs are shown in Appendix 2. There are a number of bare ridges across the site, where the turbines will be positioned. The site is difficult to traverse due to the rocky terrain, however tracks have been cleared to facilitate construction of ten data masts which are situated on representative ridges located across the area to be occupied by the turbines.
- 2.1.2 Some acacias are found growing along occasional low lying “lagas”<sup>2</sup> which pass through the site. The lagas may be periodically flooded (between twice a year to one in ten years). The southern end of the site generally has a greater frequency of acacia-commiphora scrub, although this is sparse compared to habitats further south. Around the only habitation (Sarima village) in the middle of the site and further north the habitats are dominated by a rocky desert habitat with very sparse vegetation.
- 2.1.3 Around 10km to the east is the shoreline of Lake Turkana, which is dominated by bare lava rocks.

### Method

- 2.1.4 Two Scott Wilson ecologists/ornithologists and a representative from Kenya Wildlife Services spent four days between 30<sup>th</sup> July to 2<sup>nd</sup> August 2010 travelling in and around the site to establish a suitable method, including determining the precise locations and orientation of the vantage points, the method for the transect survey and the logistics of the survey. Notes were made on all target bird species seen on and around the site to set a baseline for the monitoring.
- 2.1.5 The field survey involved visiting all ten of the wind monitoring masts which are widely scattered around the site. Each of these masts are accessed by its track which emanates from either the main track which links Lake Turkana to the nearest large settlement of South Horr or from a mast access track. Travelling to the mast locations and habitats within and around the site (e.g. Lake Turkana to the west and Mount Kulal to the east) allowed the surveyors to familiarise themselves with the site and carry out a preliminary survey of the birds and mammals using the site and surrounding habitats.
- 2.1.6 The surveyors were based off site, in South Horr which lies 24km to the south of the site (see Figure 1). South Horr is located at 3200ft a.g.l in a wooded valley surrounded by moist broadleaf forest on the higher slopes to the east the west. A stream with running water is located approximately 5km north of the village and a wide Laga (currently dry) runs north to south through to the village. The route to site was travelled in a 4 x 4 leaving at around 7am each morning and returning in the early evening, with an additional dusk visit on the 2<sup>nd</sup> August. Access was limited to the main access track through the site from the SE corner to the NW corner, a track heading east from Sarima village to Mount Kulal and recently cleared tracks leading up to the masts. The terrain and climate made it unsuitable to walk across the site any

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<sup>1</sup> Includes a mix of desert, savanna woodland, wetland, and bushland.

<sup>2</sup> An intermittent stream or water course which dries up in the dry season.

distance. The track access, openness of the habitats and clear visibility allowed the surveyors to adequately assess the distribution of target species across the site.

- 2.1.7 From South Horr northwards to the site the habitats change from tall acacia woodland to a more arid environment with less and less vegetation cover until the land becomes a rocky desert towards the north of the wind farm site and around the shores of Lake Turkana (located 8km from the site). This site ranges from 2200 to 3000ft agl. To the west of the site the land rises to over 5000ft up Mount Kulal to the village of Ngatab. This is a cooler habitat with moist broadleaf forests and steep sided valleys.

### **Ornithology**

- 2.1.8 Prior to the visit it was expected that the main focus of interest at the site would be birds of prey and bustards, which was the case. Unsurprisingly no water birds were recorded on site due to a lack of water, although small numbers were seen during the brief visit to the eastern shore of Lake Turkana (including grey headed gull, great cormorant, long-tailed cormorant and little egret). A summary of the species recorded during the fieldwork are summarised in Table 1 below, with their conservation status given in Appendix 1:
- 2.1.9 Raptors were occasionally seen on the site in low numbers (either 1-2 individuals or a pair), with a peak of seven lappet faced vultures recorded on one occasion feeding on carrion at Sarima village.
- 2.1.10 Buff-crested, Kori and Heuglin's bustards were all recorded between South Horr and southern boundary of the site, with only buff-crested bustard being recorded on site on one occasion. Our initial analysis for the reason for this is that all three bustards appear to prefer the more vegetated scrub habitats to the south of the site as opposed to the more exposed desert habitats on the site.
- 2.1.11 Other target species recorded in small numbers on site included Somali courser and crowned lapwing.
- 2.1.12 Other non-target species recorded in small numbers included the following species: Quail-plover, thekla lark, Somali fiscal shrike, chestnut-headed sparrow-lark, bristle-crowned starling, vulturine guineafowl, superb starling, white-headed buffalo-weaver, long-billed pipit and nightjar sp.
- 2.1.13 There are likely to be other target species on site that were not recorded during these surveys such as sand grouse, owls, nightjars, and other bustard species.

**Table 1 – Target species recorded during the survey**

<b>Species</b>	<b>Numbers and Location</b>
<i>Raptors</i>	
<b>Tawny eagle</b>	A pair showing territorial behaviour were recorded over a ridge in the south east corner of the site on 30-7-10. Off site an immature was seen in a tree with vultures near South Horr on 31-7-10 followed by an adult in the same location the following morning.
<b>African hawk-eagle</b>	A pair were present over a ridge in the south west corner of the site on 30-7-10. Several were recorded off site between the site and South Horr.
<b>Martial eagle</b>	An adult was recorded towards the eastern edge of the site on 30-7-10. Another adult was recorded between South Horr and the site on 1-8-10.
<b>Bateleur</b>	What was probably the same immature was recorded on two occasions just outside the south east corner of the site on the 31-7-10 and on the 1-8-10.
<b>Fox kestrel</b>	One seen a couple of kilometres south of the site on 31-8-10.
<b>Lapped faced Vulture</b>	Occasionally seen over the site in very small numbers (1-3), the largest count was a group of 7 individuals feeding on carrion at Samira village (roughly centre of site) on 31-1-10.
<b>Egyptian Vulture</b>	1-2 present in the vicinity of the Samira village on 31-1-10 and 1-8-10.
<b>White-headed vulture</b>	1-2 birds recorded occasionally over the site.
<b>African white-backed vulture</b>	1-2 birds recorded occasionally over the site.
<b>Rüppell's griffon vulture</b>	1-2 birds recorded occasionally over the site. In addition 2 were recorded in a tree near South Horr on 31-7-10.
<b>Eastern chanting goshawk</b>	1-2 individuals seen regularly on the roadside between South Horr and the site.
<b>Black-chested snake eagle</b>	Recorded between South Horr and the site on 1-8-10.
<b>Gabar goshawk</b>	One between South Horr and the site on 1-8-10
<i>Waders</i>	
<b>Somali courser</b>	Two pairs recorded on the site, likely to be widely distributed across the site
<b>Crowned lapwing</b>	One pair recorded on the site with young, likely to be a few pairs on the site in suitable habitat.
<i>Bustards</i>	
<b>Buff-crested bustard</b>	Only recorded on site on 1 occasion, but quite numerous between South Horr and the site 3-5 individuals seen daily along the roadside.

Species	Numbers and Location
<b>Kori Bustard</b>	Recorded once between South Horr and the site.
<b>Heuglin's bustard</b>	Recorded on two occasions along the roadside between South Horr and the site.

## Mammals

- 2.1.14 The majority of game in the area is believed to have been hunted to near extinction. However on the 2-8-10 two Grevy's Zebras seen at close range a few kilometres south east of the site well away from any habitation. Gerenuk was also recorded on a couple of occasions between South Horr and the site. Guenther's/Kirk's dik dik were also seen occasionally along the roadside between south Horr and the site.
- 2.1.15 A female cheetah with two well grown cubs were recorded crossing the access track at one of the few of the less rocky areas towards the south of the site on 1-8-10. Other predatory species recorded occasionally, all to the south of the site included common jackal, black backed jackal and cape hare.
- 2.1.16 There is very little suitable habitat on site suitable for roosting bats i.e. no old trees, no caves or suitable buildings. There is some foraging habitat suitable for insect bats (Microchiroptera) on site, although the habitats appear to be more suitable south of the site, for example around the dense scrub, mature woodland and the river closer to South Horr. A few bats were observed at the camp around South Horr. The site may be used by migrating bats, but no background data is available.

## 3 Bird Survey Methodology

3.1.1 To assess the likelihood of collision with wind turbines vantage point (VP) watches will be carried out overlooking the proposed site to assess the usage of the site by overflying birds. This data will then be analysed to estimate the probability of collision for potentially susceptible species and in turn the potential impact on such species can be assessed.

3.1.2 To assess the potential for birds being excluded from the wind farm site it will necessary to estimate the population size of all of the species believed to have the potential to be excluded from the proposed wind farm. To establish which bird species are found within the area of the proposed wind farm a bird recording transect will be used (transect survey). This will allow for the baseline population of all of the potentially affected species to be established so that potential impacts can be established.

3.1.3 Limitations of the bird surveys include

- Location: The site is 2 days travel from Nairobi by vehicle and up to one day from Marsabit. It takes approximately 2 hours to get on to the site by vehicle from the basecamp at South Horr.
- Disturbance: It is not possible to survey at or close to Sarima village, because the presence of 'outsiders' attracts the attention of large numbers of local children.
- Security: Surveys will either be undertaken at the guarded mast sites or from a vehicle. It is unsafe to survey on foot without a guard.
- Climate; e.g. orientation to the sun, dehydration risk, wind.
- Access and terrain; surveys will be undertaken by 4x4 vehicle from tracks, it is not possible to walk any considerable distance across the site.

3.1.4 The methodology used for the vantage point watches and transects surveys are as follows:

### Vantage point watches

3.1.5 Recording will focus on larger less manoeuvrable species for which are known to be at potential risk of collision with wind turbines (target species), these are as follows:

- All other large water birds (plover sized and above);
- Birds of prey including owls, vultures, eagles, buzzards;
- Bustards;
- Flamingos, pelicans and cranes.

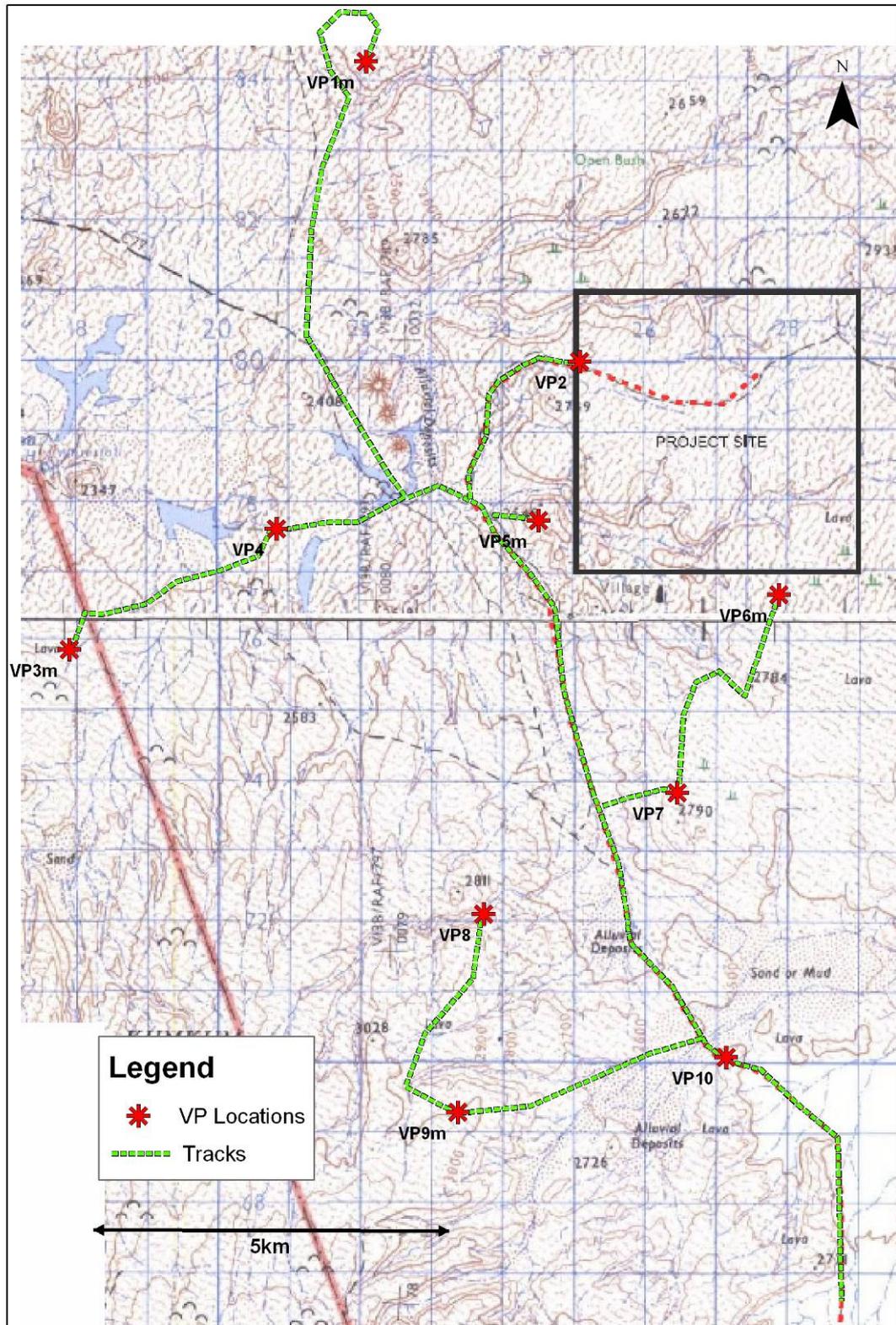
3.1.6 The vantage point (VP) watch entails recording bird flights over a set area of the proposed wind farm at ten locations (see Figure 2 and detail in Appendix 2). The orientation VP will cover a 180° field of view. Five of these VPs will be located at guarded meteorological mast sites (VP\*m) and five from a vehicle adjacent to a track (VP\*). These ten locations have been chosen as a sample to give good spatial coverage across the site to cover regular bird-flight

- lines and potential migratory movement. The locations include views of ridgelines and valleys, and the full range of habitats on the site (i.e. from desert to scrub).
- 3.1.7 Bird flight heights will be recorded within three flight height bands which correspond to the current turbine specifications (i.e. Vesta V52 turbines with a 44m hub height). These height bands will be as follows:
- Band A below rotor sweep height (<18m a.g.l<sup>3</sup>)
  - Band B within rotor sweep height (18 to 70m a.g.l)
  - Band C above rotor sweep height (>70m a.g.l)
- 3.1.8 Further details of the VP method are shown in Appendix 2. To ensure accurate identification binoculars and a tripod-mounted telescope with a suitable magnification (25-40x) will be used during all watches. The number of seconds for each bird flight will be entered onto a recording proforma (see Appendix 3). This data is then input into a computer model which is used to estimate the likely number of collisions for each species per year.
- 3.1.9 Each VP will be visited twice per month for one year with each watch lasting 3 hours, resulting in a total of 72 hours of observations at each VP. In addition during the autumn and spring migration, additional survey effort will be undertaken to ensure this important bird migration time is not missed. Between October and November 2010 and March and April 2011 each VP will be visited a total of four times per month (4 x 3 hours). The timing of the surveys at each VP will be varied to include all daylight hours and a proportion of early morning and dusk visits will be included to capture periods of bird activity in which birds may be moving to or from roosting and feeding areas.

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<sup>3</sup> a.g.l above ground level

Figure 2 – VP Locations and access tracks



### Bird recording transects

- 3.1.10 A number of different methods for the transect survey were investigated during the reconnaissance survey. The following method will be undertaken based on the low number of birds recorded, lack of suitable habitat in most areas and the limitations stated in section 3.1.3 (e.g. practicalities of surveying the site due access and climate, etc).
- 3.1.11 Access tracks through the site and up to the meteorological masts provide a good sample of the habitats across the site (e.g. desert to scattered scrub). The recording transects will be surveyed by vehicle starting from 500 metres south of the site boundary on the main track and within the site boundary on the way to and from all VP watches (see access tracks on Figure 2). Stops will be made when target bird species (same as for VPs) are encountered both flying and on the ground, and details will be recorded onto the survey proforma and base map (see Appendix 4).
- 3.1.12 The reconnaissance surveys found that there will be regular opportunities to record birds of prey during the transect survey. It should therefore be possible to establish the home territories for the majority of birds of prey using the site. This may not be possible for bustards and other ground dwelling species (e.g. plovers), although it will be possible to make an estimate of their population size derived from the transect data.

### Logistics

- 3.1.13 The current plan is that the survey team comprising; two surveyors, a driver, with possibly a guide and a mechanic will be based at South Horr during each survey cycle. To undertake one survey cycle will take five days plus travel. Depending on where the surveyors are based, it may be feasible to fly the surveyors to the airstrip at South Horr. If they were flown in early in the morning it would be possible to complete a survey during the same day and similarly on the fifth day, with a flight back in the late afternoon. This would cut down on up four days travel (to and from Nairobi) and the associated costs for each survey cycle.
- 3.1.14 Sunrise on site ranges from between 06:00 and 07:00 and sunset 18:00 and 19:00. During the survey day the surveyors will leave South Horr between 06:00 and 11:00. The timing of the VPs should be staggered to get representative data from different times of the day from dawn until dusk. Within each day, between the two surveyors 4 x 3 hour VP watches (2 at masts and 2 at non-mast locations) and transect recording is undertaken. VPs
- 3.1.15 The detailed survey programme is given in Table 2 and is described below. This may change due to unforeseen circumstances such as flooding for example. Surveys should start at the latest in early October 2010 and continue for 1 year. Surveys should be undertaken in same week each month where possible, plus an additional survey week in October, November, March and April.
- 1) The vehicle will depart South Horr in the morning between 06:00 and 10:00.
  - 2) Allow 2.5 hours to arrive at the first VP (at a mast site) whilst transect recording in the vehicle.
  - 3) Surveyor A is dropped off with survey equipment at the mast VP for a 3 hour VP survey. Surveyor B is driven to a nearby VP for their 3 hour VP whilst transect recording en-route.

- 4) Surveyor B is driven back to the mast where Surveyor A is located.
- 5) After a lunch break and verbal comparison of notes Surveyor B is left at the mast VP and Surveyor A is driven to VP where Surveyor B has just surveyed.
- 6) Surveyor A is driven to the mast to pick up Surveyor B and then all return back to South Horr. Transect recording is undertaken whilst driving to and from site VPs.
- 7) This method is repeated for five days to ensure that 6 hours of VP survey data has been collected at each of the ten VPs.

## **Equipment**

In addition to food, water and health & safety provisions the surveyors will each need the following equipment:

- Binoculars
- Tripod mounted scope with suitable magnification to identify flying raptors at long range.
- Recording forms (use black ink to complete forms)
- Compass
- GPS
- Fold-up chair
- Digital camera (for recording any unknown species if possible).

The equipment and completed survey forms should be safely stored at night. Dusk is the main problem and should be kept away from eyepieces, lens, etc.

## **Surveyor training**

- 3.1.16 A Scott Wilson Ornithologist will shadow the surveyors for the first few days to ensure forms and maps are being filled in correctly, in addition to sorting out any queries on species identification. It is expected that the ornithologists will be highly competent at bird identification including the flight identification of all raptors likely to be recorded on site.

## **Data collation and QA**

- 3.1.17 After each survey cycle the surveyors will provide Scott Wilson via email the neat VP survey forms and VP flight line maps, transect forms and maps after each survey trip. Hard copies will be kept on file and sent through on project completion.
- 3.1.18 Scott Wilson will undertake analysis of the data including modelling of potential bird collision risk and discussion on species using the site.
- 3.1.19 A QA visit will be undertaken during the autumn migration to ensure that all birds are being recorded correctly.

**Table 2 – VP Survey Programme**

<b>Day</b>	<b>Vantage Point</b>	<b>Surveyor 1</b>	<b>Surveyor 2</b>
1	VP1m	3 hours	3 hours
1	VP2	3 hours	3 hours
2	VP3m	3 hours	3 hours
2	VP4	3 hours	3 hours
3	VP5m	3 hours	3 hours
3	VP7	3 hours	3 hours
4	VP9m	3 hours	3 hours
4	VP8	3 hours	3 hours
5	VP10	3 hours	3 hours
5	VP6	3 hours	3 hours

(m = VP at Mast)

Notes: Surveys should start at the latest in early October and continue for 1 year. Surveys should be undertaken in same week each month where possible, plus an additional survey week in October, November, March and April.

## Appendix 1 - Conservation Status of target species recorded on site

**Egyptian vulture** is listed with an IUCN Red List status of '**endangered**'.

An endangered species is a population which is at risk of becoming extinct because it is either few in numbers, or threatened by changing environmental or predation parameters.

**White-headed vulture** and **Lappet faced vulture** are listed with an IUCN Red List status of '**vulnerable**'.

Vulnerable species are likely to become Endangered unless the circumstances threatening its survival and reproduction improve. Vulnerability is mainly caused by habitat loss or destruction. Vulnerable species are monitored and are becoming threatened.

Populations of **African white-backed vulture**, **Rüppell's Vulture** have also declined. These species are listed with an IUCN Red List status of 'near threatened' and the IUCN predicts that populations of the species will continue to decline.

**Bateleur** and **martial eagle** are listed as 'near threatened', and all the other target species recorded including the bustards are of 'least concern'.

Of the mammals **Grevy's zebra** has an IUCN Red List of 'endangered', **cheetah** is listed as 'vulnerable' and **gerenuk** listed as 'near threatened'.

## Appendix 2 –Vantage Point Location and Detailed VP Method

**VP1m** Grid ref. N2 34.041 E36 48.011

VP Orientation: 180° centre line is EAST



**VP2** Grid ref. N2 31.783 E36 49.602

VP Orientation: 180° centre line is NORTH



**VP3m** Grid ref. N2 29.546 E36 45.840

VP Orientation: 180° centre line is NORTH EAST out of the gate at mast site (Photo n/a)

**VP4** Grid ref. N2 30.532 E36 47.375

VP Orientation: 180° centre line is NORTH WEST



**VP5m** Grid ref. N2 30.623 E36 49.223

VP Orientation: 180° centre line is SOUTH WEST just outside entrance of Mast Site



**VP6m** Grid ref. N2 29.938 E36 51.159

VP Orientation: 180° centre line is NORTH



**VP7** Grid ref. N2 28.459 E36 50.283

VP Orientation: 180° centre line is EAST



**VP8** Grid ref. N2 27.359 E36 48.833

VP Orientation: 180° centre line is SOUTH EAST



**VP9m** Grid ref. N2 26.003 E36 48.744

VP Orientation: 180° centre line is WEST



**VP10** Grid ref. N2 26.456 E36 50.711

VP Orientation: 180° centre line is WEST



## Methods for Vantage Point (VP) watches

This is taken from the generic guidance for onshore wind farms by Scottish Natural Heritage. Full details can be found at <http://www.snh.gov.uk/planning-and-development/renewable-energy/onshore-wind/>

Watches are undertaken between dawn and dusk by a single observer under conditions of good ground visibility (>3km).

Each watch should last a maximum of three hours but can be suspended and then resumed to take account of changes in visibility (e.g. fluctuations in the cloud base). Experience from field trials suggest that the acuity of most observers declines after three hours, and some may prefer to conduct shorter watches. A gap of at least one hour between watches is advisable.

During each watch the area in view is scanned until a target species is detected at which point it is followed until it ceases flying or is lost from view. The time the target bird was detected and the flight duration are recorded. The route followed is plotted in the field onto the field maps. The bird's flight height is estimated at the point of detection and then at 15 second intervals thereafter, using, for example, a count-down timer with an audible alarm. A 15 second interval is recommended as a practical compromise that aims to minimise dependency within data while maximising the sample of observations. Flight heights will be classified to height bands reflecting rotor swept area as appropriate (see main text). Training and checking of observer accuracy in relation to height estimation should be made and accounted for where this is possible. Use of a clinometer and range finder provides one means of determining flight heights accurately. Observations of target species take priority over completion of activity summaries (b).

At the end of each watch, the locations and activity indicative of breeding by target species should be recorded on the map.

### Recording

Data should be recorded on the form and maps. Forms must be completed for each VP watch, regardless of whether target species were recorded or not. Use different forms for different watches (i.e. do not combine data from different watches onto one form or map). Forms used should encapsulate the observations listed below and, of course, record start and finish times, observer name, weather records and VP location (cross referenced to the map).

#### Forms:

- For each watch number each flying bout consecutively. Cross reference this number to the flight path recorded on the relevant map.
- Record the time the bird is first detected to the nearest minute e.g. 15:45.
- Record duration of flying bout to the nearest second.
- For each flying bout: starting at 0 (zero – point of first detection), number each 15 second interval consecutively, and tick appropriate flying height for each 15 second interval.
- Rule off under each flying bout to highlight end of recording.

#### Map(s):

- Mark the location of the VP used.
- Mark flight paths of target species and indicate direction of flight. Use different colours and symbols for each species. Provide key on back of form.
- Number each flying bout and cross reference with Form.
- Use additional map(s) if data records are cluttering initial map.



