VOLUME I

ENVIRONMENTAL MANAGEMENT PROGRAMME FOR THE SAN KRAAL WIND ENERGY FACILITY, NORTHERN CAPE PROVINCE

On behalf of

SAN KRAAL WIND POWER (PTY) LTD

February 2022

DFFE REFERENCE: 14/12/16/3/3/2/1029/1 and 14/12/16/3/3/1/1029/1/AM3

DRAFT FOR PUBLIC COMMENT

Version 2

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DEVELOPMENT DETAILS

DFFE Reference:	14/12/16/3/3/2/1029/1 and 14/12/16/3/3/2/1029/1/AM3
Arcus Reference:	3329 San Kraal WEF
Title:	Environmental Management Programme for the San Kraal Wind Energy Facility, Northern Cape Province
EAP:	Ashlin Bodasing - Arcus Consultancy Services South Africa (Pty) Ltd, 2019 Ashlin Bodasing - Arcus Consultancy Services South Africa (Pty) Ltd, 2021
EAP Assistant:	Aneesah Alwie - Arcus Consultancy Services South Africa (Pty) Ltd, 2022
Project Company (Applicant):	San Kraal Wind Power (Pty) Ltd
Report Status:	DRAFT FOR PUBLIC PARTICIPATION Version 2 – Submission in Compliance with Conditions 17, 18, 19 and 20 of the Environmental Authorisation

PUBLIC PARTICIPATION DETAILS

This Environmental Management Programme (EMPr) has been updated based on the relevant conditions in the Environmental Authorisation (EA) and specialist pre-construction site walkthroughs.

Invitation to Comment: Members of the public, local communities, and stakeholders are invited to comment on this final EMPr which is available for public review and comment at the following locations.

Location	Physical Address	Contact person
Electronic Copy Location		
Arcus Website	https://arcusconsulting.co.za/projects/	Aneesah Alwie 021 412 1529
Hard Copy Location		
Noupoort Library	4 Shaw Street, Noupoort, 5950	Martha Van Eyk 084 243 1609
Trading Hours	Monday – Friday 10h00 – 16h30	
Kindly take note of COVID-19 Protocols No Mask = No Entry | Please sanitize before and after use of the reports		
Comment Submission		
Comments can be submitted to: Arcus Consultancy Services South Africa (Pty) Ltd Post: 240 Main Road, 1st Floor Great Westerford, Rondebosch, 7700 Tel: +27 (0) 21 412 1529 | E-mail: projects@arcusconsulting.co.za		

Following the 30-day public participation, this EMPr including the Final Site Layout, will be submitted to the Department of Forestry, Fisheries and the Environment for approval prior to commencement of an activity.

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1 INTRODUCTION

EDF Renewables (Pty) Ltd ('EDF') (previously InnoWind), through the Specialist Purpose Vehicle (SPV) San Kraal Wind Power (Pty) Ltd (the 'Developer'), received environmental authorisation (EA) for the development of a 390 MW Wind Energy Facility (WEF) located near the town of Noupoort in the Northern Cape Province (Figure 1). Subsequent to the issue of EA in 2018, an application was submitted to the Department of Forestry, Fisheries and the Environment (DFFE) to split the 390 MW facility in two, namely San Kraal WEF and Hartebeesthoek East WEF.

This EMPr, for the San Kraal WEF ('proposed development') represents the requested update to the previous EMPr submitted with the Final Amendment Report (Arcus, 2019 and 2021), including any new mitigation measures that were incorporated in the specialist's assessments (Original Reports, 2016; Amendment Reports, 2019; and Specialist Assessments based on the Conditions of the EA, 2021). The EMPr outlines measures to be implemented in order to minimise adverse environmental degradation associated with construction of the proposed development. It serves as a guide for the contractor and the construction workforce on their roles and responsibilities concerning environmental management on site, and it provides a framework for environmental monitoring throughout the life cycle of the development, i.e., from Design phase until after Decommissioning phase.

This document must be seen as dynamic, and be updated when and if required, throughout the lifecycle of the project.

1.1 Details of the Developer and the Environmental Assessment Practitioner

Details of the Developer (Applicant)	
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Environmental Assessment Practitioner	
EAP	Arcus Consultancy South Africa Services (Pty) Ltd
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Qualifications	Bachelor of Social Science (Geography and Environmental Management)
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1.2 Purpose and Aims of this Document

An Environmental Management Programme (EMPr) for the proposed development is required in terms of the Appendix 4 of the National Environmental Management Act, 1998 (Act 107 of 1998), EIA Regulations of 2014 (GNR 326), as amended.

As per the Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning (DEA&DP) Guideline for Environmental Management Plans (Lochner 2005), the over-arching objectives of an EMPr is (1) to ensure compliance with regulatory authority stipulations and guidelines, (2) to ensure sufficient allocation of resources on the project budget, (3) to verify environmental performance through information on impacts as they occur, (4) to respond to changes in project implementation not considered in the EIA, (5) to respond to unforeseen events and (6) to provide feedback for continual improvement in environmental performance.

The aim of this Environmental Management Programme is to achieve the above objectives by:

- Defining the environmental management objectives to be realised during the life of the project, in order to enhance benefits and minimise adverse environmental impacts;
- Describing detailed actions needed to achieve these objectives, and mechanisms that address changes in the project implementation, emergencies and unexpected events;
- Clarifying institutional structures, roles, communication and reporting processes;
- Describing the link between the EMPr and associated legislated requirements; and
- Describing requirements for record keeping, reporting, review and auditing.

The purpose of this EMPr is to provide consistent information and guidance for implementing the management and monitoring measures identified in the Environmental Impact Assessment (EIA) process, and to help achieve environmental policy goals. The purpose of this EMPr is to ensure the Applicant and its contractors/staff are in compliance with the recommendations and conditions determined through the EIA process, as well as guarantee continuous improvement of environmental and social performance, reducing negative impacts and enhancing benefits of the proposed project.

This EMPr is a dynamic document, which should be updated when required. This EMPr will be updated to include inputs from interested and affected parties (I&APs) during the public review and comment period before final approval from the DFFE. Moreover, it should be considered critical that the EMPr be updated to include site-specific information and specifications as required throughout the life-cycle of the facility - this will ensure that project activities are planned and implemented taking into account a changing environment and sensitive environmental features.

2 ENVIRONMENTAL IMPACT ASSESSMENT PROCESSES

The original environmental impact assessment (EIA) for the 390 MW San Kraal WEF was completed, and received EA in 2018. Subsequent to the issue of the EA, an application was submitted to the DFFE to split the 390 MW facility into two, namely San Kraal WEF and Hartebeesthoek East WEF.

Due to the split / amendment to the layout of the facility, the specialist studies were updated and the potential impacts reassessed. Potential environmental impacts were evaluated according to their extent, duration, intensity and magnitude. Negative impacts of the proposed project on the biophysical environment included clearing of vegetation that leads to habitat fragmentation, potential loss of species of concern, soil erosion, and surface water pollution; while social-economic impacts being minimal loss of agricultural land, disruption of social relations within the proposed area by the potential influx of jobseekers, spread of diseases, loss of potential heritage resources and impact on sense of place.

All impacts were identified and reassessed at different stages (design/planning, construction, operation and decommission) and possible mitigation or enhancement measures assigned to reduce the significance of negative impacts or enhance positive impacts were provided in the specialist reports (2019). Mitigation measures proposed by the specialists were included in this EMPr.

San Kraal Wind Power (Pty) Ltd was awarded preferred bidder in the Round 5 of the REIPPPP. Before commencement of the activities and construction of the WEF, specialists conducted a site survey of the final layout and any new recommendations were provided in a report (2021). An Environmental Sensitivity Map (Figure 2) is attached to this EMPr.

As this is a legally binding document, all mitigation measures included herein must be adhered to by the developer and operator as applicable.

2.1 EMPr Update

Condition 17 of the EA for the San Kraal Split WEF (DFFE Reference 14/12/16/3/3/2/1029/1 and 14/12/16/3/3/1/1029/1/AM3), established that the Environmental Management Programme (EMPr) was not approved and should be amended to include measures as dictated by the final site lay-out map and micro-siting, and the provisions of the EA.

The following specialists conducted a walkthrough of the site to assist with micro-siting the layout of turbines and other infrastructure:

- Aquatic Specialist
- Flora and Fauna Specialists
- Avifaunal Specialist
- Bat Specialist
- Archaeological Specialist

This EMPr, for the San Kraal WEF ('proposed development') represents the requested update to the previous EMPr submitted, including any new mitigation measures that were incorporated in the specialist's assessments (Original Reports, 2016; Amendment Reports, 2019; and Specialist Assessments based on the Conditions of the EA, 2021).

Based on the results of the above mentioned specialists walk through assessments, the sections below provide their recommendations used for the final site layout and micro siting and this EMPr. The specialist walkthrough assessment reports are included as Volume II.

2.1.1 Aquatic

Following the walkthrough, the initial aquatic assessment findings can be upheld, and when coupled to the proposed amended layout, with no direct impacts to any critical aquatic ecosystems, very high sensitivity are not anticipated. This is based on the consideration that with the exception of one watercourse crossing, the proposed wind farm layout has avoided all the important or high sensitivity aquatic systems.

Based on the amended layout and walk through, the grid connection towers will be placed outside any of the indicated aquatic zones and access tracks will only be required in some areas along the proposed corridors. It is recommended where possible to use existing tracks and not to create new crossings within these systems. Should new crossings be required these must be licensed under the appropriate General Authorisation in terms of Section 39 of the National Water Act 36 of 1998 (NWA, 1998).

The aquatic specialist would therefore not object to the approval of any of the required water use authorisations for this facility as based on the potential threshold triggers General Authorisations would seem appropriate. This is based on the condition that all the mitigations in the previous aquatic assessment (2018 and 2019) (including EMPr

recommendations) and as identified in the Risk Assessment Matrix (Appendix C) are considered.

The 21 (c) and (i) Risk Assessments conducted (Appendix C) further indicate that the proposed water uses will have a low risk rating after considering all listed control measures. Specific control measures are listed for the transmission line, but in essence as the designs are finalised, any of the required access track / road crossings must be evaluated on a case by case basis to ensure that the potential impacts remain low (habitat disturbance and erosion).

Due to the low risk ratings, a General Authorisation in terms of Section 39 of the National Water Act (NWA), 1998, could be issued for the development (Table 2-1). This is mostly substantiated by the fact that the proposed layout will avoid critical aquatic features (wetlands), which are also highlighted in the Northern Cape Biodiversity Spatial Plan as Critical Biodiversity Area Type 1 and 2 areas (Holness & Oosthuysen, 2016).

Table 2-1: Section 21 Uses of the San Kraal WEF

Section 21 Uses	Affected aquatic resources	Impact with mitigation
c & i	Any internal roads and or underground cables that cross watercourses. The watercourses have been avoided by most of the wind structures with the exception of one crossing (High sensitivity areas)	LOW – as the impact system only contains flows for a minimal timeframe approximately every 5-10 years.
c & i	132 kV Overhead grid connection access roads, with some portions of the proposed alignment within the watercourse including a 32 m buffer	LOW – as towers / pylons can be placed outside any aquatic systems and their buffers, however access roads may need to cross certain areas although several existing tracks will be used as far as possible. The number of applications will be considered once the tower positions have been determined and or formalised access crossings have been investigated

The following recommendations are reiterated:

- Vegetation clearing should occur in a phased manner in accordance with the construction programme to minimise erosion and/or run-off.
- All construction materials including fuels and oil should be stored in demarcated areas that are contained within berms / bunds to avoid spread of any contamination. Washing and cleaning of equipment should also be done in berms or bunds, in order to trap any cement and prevent excessive soil erosion. Mechanical plant and bowsers must not be refuelled or serviced within or directly adjacent to any channel. It is therefore suggested that all construction camps, lay down areas, batching plants or areas and any stores should be well outside any demarcated water courses.
- All cleared areas must be re-vegetated after construction has been completed.
- All alien plant re-growth (mostly forbs) must be monitored, and should it occur, these plants should be eradicated. The scale of the operation does however not warrant the use of a Landscape Architect and / or Landscape Contractor.

2.1.2 Flora and Fauna

The ecological sensitivity of the development site is determined largely by the topography and elevation of the landscape. The only No-Go area that was observed within the development area was the small gorge with springs and wetlands. This area has been avoided by the development and the layout is considered generally acceptable, although

there were a few turbines which were marginally within areas considered to be High sensitivity and which have since been removed or adjusted to avoid these areas.

Since the original ecological assessments were undertaken for each of the separate wind energy facility projects, the specialist walkdown was undertaken for the wider project area and thus it has been possible to refine and better understand the vegetation composition and local distribution of flagged species of conservation concern within the greater area of influence. Several Species of Conservation Concern were identified during the initial ecological assessments. In addition, with the inclusion of additional available information, observations and surveying during the walkdown, several additional species have been identified.

Flora and Fauna Species of Conservation Concern

The species are widespread and are not associated with any specific turbine or WEF infrastructure component. Several geophytic species are also likely to be present but were not recorded during the initial assessment and were not visible during the walkdown, as the season was not favourable. Respective permits will be required before commencement of flora relocation.

Sensitive Areas and Species Population

Sensitive areas identified either in the original biodiversity assessment and/or observed during the walkdown include the following:

- Rocky Outcrops and Ridges on slopes and mountain peaks – outcrops generally have a greater density of succulent species (Aizoaceae and Crassulaceae) that will require relocation;
- Rivers, seeps, watercourses, wetlands and pans – minimise impacts to aquatic processes;
- Sub-populations of flagged species of conservation concern – often associated with rocky areas; and
- Slope and mountain edges – excessive cut and fill will elevate impact.

Turbines, Roads and Other Infrastructure

A summary analysis of specific infrastructure risks is provided in Table 2-2 below.

Table 2-2: Summary of WEF and infrastructure vegetation and sensitivities

Turbine	Habitat[1]	Comment
SK1	Rocky/shrubland	Very close to edge, suggest slight shift to the east (20-30 m)
SK2	Rocky/shrubland	No issue
SK3	Rocky/Grassland	No issue
SK4	Rocky/shrubland	No issue
SK5	Rocky/Grassland	No issue
SK6	Rocky/Grassland	No issue
SK7	Rocky/Grassland	No issue
SK8	Rocky/shrubland	No issue
SK9	Rocky/Grassland	No issue
SK10	Rocky/Grassland	No issue
SK11	Rocky/Grassland	No issue

[1] Rocky habitat generally more likely to have more species of conservation concern for relocation as well as reptiles (snakes and lizards).

Turbine	Habitat[1]	Comment
SK12	Rocky/Grassland	No issue
SK13	Rocky/Grassland	No issue
SK14	Rocky/Grassland	No issue
SK15	Rocky/Grassland	No issue
SK16	Rocky/Grassland	No issue
SK17	Rocky/Grassland	No issue
SK18	Rocky/Grassland	No issue
SK19	Rocky/Grassland	No issue
SK20	Rocky/Grassland	No issue
SK21	Rocky/Grassland	No issue
SK22	Rocky/shrubland	No issue
SK23	Rocky/Grassland	No issue
SK24	Rocky/Grassland	No issue
SK25	Rocky/Grassland	No issue
SK26	Rocky/Grassland	No issue
Substation	Rocky/Grassland	No issue
Powerline	Rocky/Grassland	A bend in the powerline falls close to a watercourse near turbine SK24. Ensure that pylon is not placed in watercourse.

During the walkthrough visit, several turbine footprints were identified that overlapped slightly with outcrops. Based on the recommendation, the developer had made layout adjustments to avoid such areas where possible.

Recommendations

Following the walkthrough sensitivities of the proposed development pose no ecological impact. The following specific recommendations is required for the project:

- A flora and fauna search and rescue (relocation) must be undertaken before commencement of vegetation clearing. A comprehensive list of species for which permits will be required is provided in Appendix D.
- Where there are further changes/updates to the vertical and horizontal alignments of the road network and site laydown area, such sections/areas must be reassessed in order to determine any further risks and impacts to the ecology and/or species.
- Where turbine footprints could not be moved to avoid overlap with outcrops, minor layout adjustments should be implemented during final surveying and pegging out to avoid such areas where possible. Rocky outcrops should not be removed unnecessarily where they can be avoided.

2.1.3 Avifauna

The terms of reference for the walkthrough report were to assess if there are any changes required to the final proposed layout based on any newly discovered avifaunal sensitivities which may not have been present when the original 12-month pre-construction monitoring was performed in 2015 - 2016. The results of the original pre-construction monitoring, as well as additional nest searches conducted subsequently (11 – 15 April 2021), were used as the basis for the recommendations provided.

A total of seven (7) Verreaux's Eagle nests were recorded during nest searches around the proposed WEF which falls within the potential impact zone of the proposed WEF and associated grid connection. As the developer has reduced the number of turbines from the original authorised 35 turbines to an optimised layout of 26 turbines, this is a significant development from an avifaunal perspective as the resulting 25% reduction in the number of turbines will materially reduce the collision risk based on *Thaxter et al.* (2017) analyses.

The recommended buffer zones listed below replaced the proposed buffers zones[2] listed in the original specialist study (2017):

- The 3.4 km buffers are turbine no-go buffers to mitigate against turbine collisions. Other infrastructure is allowed.
- The 5.2 km buffers are areas where turbines can be constructed subject to pro-active mitigation (see below).
- The 1.5 km buffers are no-go buffers for all infrastructure to prevent the disturbance of breeding Verreaux's Eagles.

Further recommendations for inclusion in the EMPr are provided below:

- It is recommended that suitable pro-active mitigation be implemented at all turbines up to 5.2 km from a Verreaux's Eagle nest, once the wind farm commences with operations, to reduce the risk of collisions of Verreaux's Eagles. Suitable pro-active mitigation measures should be selected prior to commencement of operation, informed by best-available information at the time of implementation. This could include measures such as blade painting and/or Shutdown on Demand.
- It is recommended that 33 kV cables are buried where technically possible.
- Those sections where the medium voltage cable should preferably not be trenched due to technical or environmental reasons, but needs run on overhead poles, the proposed 33 kV pole designs must be approved by the avifaunal specialist, to ensure that the designs are raptor-friendly.
- It is recommended that bird flight diverters are fitted to all the 33 kV overhead lines.

All turbines and infrastructure currently adhere to the buffer zones. All mitigation measures proposed in the avifauna impact report, and which are included in the EMPr, are to be strictly adhered to.

2.1.4 Bats

The aim of the site visit was to conduct a site walkthrough and micro-siting process to ground truth important bat features. Further to this, the site visit was conducted to ensure that all turbine blades and other infrastructure are positioned outside of their respective bat sensitivity buffers.

The site walk-through visit took place from 18 to 23 October 2021. Important bat features, sensitivities and final layouts were loaded onto the ArcCollector app to ground truth the features and update the sensitivities accordingly. The positions of the turbines, powerlines, roads, substation, and transformer were prioritised. Additionally, habitats with roosting potential were identified beforehand and inspected for possible bat roosts which included rocky outcrops, cliffs, buildings and trees.

During the site visit, additional important bat features were identified (including dams, water pumps and drainage lines) as well as features that did not require buffers (such as

[2] The 2nd edition of the Verreaux's Eagle Guidelines was finalised in November 2021 and incorporates the Verreaux's Eagle Risk Analysis model developed by Dr Megan Murgatroyd. The model identifies high, medium and low risk areas for breeding adults, or alternatively recommends an increased high risk no-go area of 3.7 km around nests, and pro-active mitigation for all turbines within a 5.2 km medium risk radius around a nest. Given the fact that the developer already has an authorised layout of 35 turbines, which has now been reduced to 25, they have indicated that 3.4 km no turbine buffers are the furthest they can go in terms of increasing buffer zones.

drainage lines that were not apparent, or missing water features). Buffers were defined based on these observations. In the original assessment, sensitive areas were defined as either high (with a 200 m buffer) or moderate (with a 100 m buffer). For the purpose of micro-siting the current authorised layout, the buffers in the constraints map have been refined from the original assessment and should be viewed as No-Go areas for turbines (Figure 2). All buffers presented during the original assessment were included in these refined no-go areas. As the moderate sensitivity areas have not been altered, the recommendations set out in the original EIA should still apply. The no-go buffers consider the authorised blade length (87.5 m) and hub height (137 m) and subsequently considers the distance to turbine base.

All turbines currently adhere to the buffer zones. All mitigation measures proposed in the pre-construction bat impact report, and which are included in the EMPr, are to be strictly adhered to.

2.1.5 Heritage / Archaeology

The pre-construction was conducted by the heritage specialist to ground truth the authorised wind turbine generator (WTG) positions, internal WEF cable and roads alignments, substation sites, laydown areas, etc., to identify heritage resources which may be impacted by the construction, operation and decommissioning of the WEF, to assess their significance and provide recommendations for mitigation that can be incorporated into this final Environmental Management Programme (EMPr). Given the previous assessments of the site, the coverage already achieved and the specialist knowledge of the heritage potential of the site, the pre-construction survey did not aim to resurvey the entire WEF layout, but rather to fill in gaps in previous survey coverage particularly in accessible areas where there was the potential for archaeological sites and material to be present.

A survey of areas of the WEF not previously surveyed was undertaken on 16 October 2021. No trial holes were dug and no material was removed from the project area. All observations were based on visible surface material. The assessment found that while a small number of significant heritage resources may be impacted by the construction of the San Kraal WEF, provided the mitigation measures recommended in this report are implemented, the overall impact of the construction of the WEF is likely to be of low significance and tolerable from an archaeological perspective and that the proposed activity is acceptable.

The current design and layout of the San Kraal WEF has taken the results of the 2017 and 2019 archaeological assessments into account and the reduction in the number of archaeological sites likely to be affected by the WEF is a clear advantage of the revised San Kraal layout. With respect to the sites identified within the WEF area in 2017 and 2019, the HIA (2017 and 2019) made the following recommendation:

- JG017-JG019: The HIA recommended that a collection of the artefactual material from this MSA stone scatter, located within 30 m of a proposed turbine location (WTG 78), should be take place prior to commencement of the construction of the WEF. In the current layout of the WEF, WTG78 has been replaced with WTG 607 which is now more than 200 m distant from JG017-JG019. It is unlikely therefore that this site will now be impacted by the construction of the WEF.
- As part of the constraints mapping for the WEF during the EIA process, an exclusion zone / no-go area was placed around the historical farm complex JR003, JR004, JR006 and JR007 (J143-148, J149-155, J156-166, G032-040 in 2021).
- The 2019 EA Amendment report for San Kraal found that the stone 'wolwehok' (J036) and the isolated MSA flake (J037) were likely to be impacted by one of the WTGs and recommended the following in respect of the former:

- The packed stone 'wolwehok' (JG036) will be affected by the construction of WTG 409 and must either be recorded by an archaeologist prior to construction work, or the turbine location must be adjusted to avoid the site. If the latter option is chosen, the site must be cordoned off during construction activities and treated as a no-go area by WEF staff and contractors.

Based on the current WEF layout, the remainder of the archaeological and historical sites identified in 2017 and 2019 are sufficiently distant from WEF infrastructure not to be affected, or of sufficiently low heritage significance (i.e., not conservation-worthy), such as the MSA flake (J037), that their loss, should it occur, would be tolerable. Furthermore, neither of the two new archaeological occurrences recorded in 2021 (J167-169 and G041) will be at risk from the WEF: the former because this Later Stone Age Lockshoek scatter lies in an area that will not be subject to impacts from the WEF and the latter because the WTG 101-104 line, which passed close to this site, has been removed from the latest version of the WEF layout since the survey took place.

Following the walk-through and recommendations of the assessment reports, the following is recommended for implementation:

- Instead of a collection of the artefactual material JG017-JG019, a 50 m no-go area must be implemented around the site.
- The complex of sites JR003, JR004, JR006 and JR007 (J143-148, J149-155, J156-166, G032-040 in 2021) should remain a no-go area.
- In the current layout of the WEF, the position of WTG SK13 has not changed and the 'wolwehok' may thus still to be subject to impact during the construction of the WEF. The 2019 recommendation to either fully record the structure before construction or to cordon it off as a no-go area thus remains valid. If it is a no-go area, it is further recommended that the buffer should be no less than 30 m around the structure.
- It is likely that archaeological sites and artefacts that have not been identified will be present within the San Kraal WEF and may be subject to impacts arising from its the construction. However, the extensive survey work carried out on the WEF site and the nature of the sites that have been recorded within the WEF suggest that should such sites occur, they will tend to be isolated artefacts or thin open scatters of mainly MSA lithics on deflated erosion surfaces, which are of limited archaeological value and significance. It is unlikely that significant archaeological sites will be impacted by the construction of the WEF.
- With regard to rock art and rock engravings, the geology of the WEF site does not lend itself to rock shelters where rock art may be present, and the type of patinated dolerite boulders which often have rock engravings were not noted on the site during the various surveys. It is recommended, however, that in the unlikely event that either rock art or rock engravings are encountered during the construction of the WEF, work must cease in their vicinity, they must be cordoned off and left *in situ* and SAHRA must be informed of the discovery so that a decision can be made about how to deal with them.
- Should any human remains be encountered at any stage during earthworks associated with the project, work in the vicinity must cease immediately, the remains must be left *in situ* but made secure and the project archaeologist and SAHRA must be notified immediately so that a decision can be made about how to mitigate the find.
- The Environmental Management Programme Report for the San Kraal WEF requires no change in respect to the assessment of impacts on archaeological sites and materials. While a small number of significant heritage resources may be impacted by the construction of the San Kraal WEF, provided the mitigation measures recommended are implemented, the overall impact of the construction of the WEF is likely to be of low significance and tolerable from an archaeological perspective and the proposed activity is acceptable.

The final layout has considered the no-go areas recommended above and the implementation of this EMPr will ensure that these heritage exclusion zones are implemented and respected.

3 THE SAN KRAAL WEF DEVELOPMENT

The split application of the original San Kraal WEF received EA on the 26 October 2021. The amended San Kraal WEF (the 'proposed development') received EA for a total WEF output of 217 MW, which comprises up to 35 wind turbines with a generation capacity of 6.2 MW each.

Following receipt of preferred bidder status during Round 5 of the REIPPPP, the final layout will consist of up to 26 wind turbines for a total WEF output of up to 217 MW.

The wind farm will connect to the SK-PH collector substation via medium voltage lines, which will in turn connect to the Umsobomvu Substation via an approved 132 kV transmission line. The new on-site substation, SK-PH collector substation and other associated infrastructure received environmental authorisation on 29 September 2021 (DFFE Reference 14/12/16/3/3/1/2076/3).

Table 3-1 and 3-2 below provides the co-ordinates and technical details of the proposed development as authorised in the San Kraal WEF EA (and as amended).

Table 3-1: Co-ordinates of the San Kraal WEF Site and Infrastructure

	Authorised Latitude	**Authorised Longitude**
North-West Corner	31° 12' 01.5575" S	024° 58' 53.8479" E
North-East Corner	31° 12' 08.1754" S	025° 07' 01.2350" E
South-West Corner	31° 14' 35.4874" S	024° 58' 37.9684" E
South-East Corner	31° 14' 21.9632" S	025° 07' 50.3112" E
Substation location (centre point)	31° 14' 55.27" S	25° 1' 1.68" E
Construction camp laydown area	31° 13' 23.95" S	24° 2' 44.04" E
Construction camp laydown area	31° 12' 33.05"S	25° 3' 18.79" E

Table 3-2: Technical Details of the San Kraal WEF

Component	**Description / Dimensions**
Authorisation Holder (also referred to as the Project Company)	San Kraal Wind Power (Pty) Ltd
Location of the Site	Approximately 6 km south-east of the town of Noupoort
Farm and SG Codes	RE 181 Holbrook: C02100000000018100000 15/182 Hartebeeshoek: C02100000000018200000 3/182 Hartebeeshoek:C02100000000018200003 46/182 Hartebeeshoek: C02100000000018200046
Site Access	An existing public gravel road (the Oorlogpoort Road) will be used to access the site. The road is situated off the N9 south of the town of Noupoort, to the north of the site.

Component	Description / Dimensions
Export Capacity	Up to 217 MW
Proposed Technology	Wind Turbines

3.1 The Final San Kraal Site Layout

The final site layout (Figure 3) has been refined based on the recommendations made post specialist and Engineering team (of the Applicant) site walkthroughs.

Turbine positions have moved slightly to accommodate any buffers recommended by the avifauna, ecological and heritage specialists (as per Section 2.1). Upon approval of the final layout and this EMPr by the DFFE, if any changes are made to the layout or EMPr this must be submitted to the DFFE for approval. Table 3.3 below provides the description of the final San Kraal WEF turbine specifications.

Table 3-3: Technical Details of the San Kraal WEF

Component	Description / Dimensions	
	Authorised Turbine Details	**Final Turbine Details**
Proposed Technology	Wind Technology	Wind Technology
Number of Turbines	Up to 35	26
Hub Height from Ground Level	Up to 137 m	124 m
Rotor Diameter	Up to 175 m	165 m
Width and Length of Internal Roads	Internal roads width: Up to 14m during construction and up to 8m during operation Internal roads length: Approximately 53 km	*Remain unchanged.*

3.2 Components of the San Kraal WEF Development

The WEF will comprise the following:

- A maximum generating capacity of up to 217 MW;
- 26 turbines with a generating capacity of up to 6.2 MW and a rotor diameter of 165 m and a hub height of 124 m;
- Foundations (25 x 25 m) and hardstands associated with the wind turbines;
- Internal access roads of between 8 m during operation and 14 m during construction wide to each turbine;
- Medium voltage cabling between turbines and the onsite switching station (each 1000 m^2), to be laid underground where technically feasible;
- Overhead medium voltage cables between the on-site switching station and on-site substation (approximately 4 km in length) and between turbine rows where necessary;
- An on-site substation & OMS complex (180000 m^2) to facilitate stepping up the voltage from medium to high voltage (132 kV) to enable the connection of the WEF to the national grid;
- A 25 km 132 kV high voltage overhead powerline from the on-site substation to the proposed Umsobomvu Substation to the national grid;

- Temporary infrastructure including a construction camp with batching plant (40000 m^2); and
- A laydown area approximately 7500 m^2 in extent, per turbine.

The proposed project will comprise components as described below.

3.2.1 Turbines

Up to 35 turbines are approved of which 26 turbines will be constructed. The turbines will be placed on steel and concrete foundations which will each occupy an area of up to 25 m by 25 m in total (which includes the maximum total area that may need to be disturbed during construction of the foundation), and be typically up to 5 m deep and may include concrete and steel plinths depending on local ground conditions.

Once construction is complete, much of the foundation area can be rehabilitated.

3.2.2 Hard Stand Areas

Each turbine requires an area of hard-standing to be built adjacent to the turbine foundation. This provides a flat, stable base on which to lay down the turbine components ready for assembly and erection and to site the two cranes necessary to lift the tower sections, nacelle and rotor into place.

A hardstanding area of up to 7500 m^2 will be established adjacent to each turbine location. This will be used to provide a platform for cranes to operate during construction (and unscheduled maintenance), as well as a clear area to lay out turbine components prior to erection.

The crane hard-standing will be left in place following construction in order to allow for use of similar plant, should major components need replacing during the operational phase of the proposed development.

3.2.3 Laydown Areas

Temporary infrastructure would include a site camp, laydown areas and a batching plant. Additional temporary laydown areas will be required for equipment and component storage during construction across the site. These areas will be levelled and compacted and used for component storage.

3.2.4 Electrical Cabling and Onsite Substation

The electricity from the turbines will be transferred via a 33 kV electrical network to 2 x 80 MVA on-site switching / step-up substations. Where possible this will be underground but the feasibility of this will be confirmed as the design progresses and geotechnical studies are conducted. The on-site switching / step-up substations will house electrical infrastructure such as transformers and switch gear to enable the energy to be transferred into the existing national grid. The operations and maintenance building including parking will be approximately 7500 m^2.

Underground cabling will link the turbines to each other and to the on-site transformer / control building. Detailed construction and trenching specifications will depend on the ground conditions encountered. Typically, cables would be laid in a trench approximately 1 m deep and 0.5 m wide. To minimise ground disturbance, cables will be routed along the side of the access tracks where practicable.

3.2.5 Access

The turbine locations will be accessed through a network of unsealed roads which will be established across the WEF Site. These access roads will be between 8 m and 14 m wide.

A width of 14 m is required for curves in order to allow trucks to turn. Such roads are required to facilitate access for the cranes and abnormal load deliveries of turbine components.

Existing farm access roads will be upgraded and utilised where possible, as will existing watercourse crossings. Some of the aggregate required for the construction of the on-site tracks may be sourced from cut and fill operations during construction from within the proposed development site with additional material imported from permitted quarries as required.

3.2.6 Compound

There will also be an on-site office compound, including site offices, parking and an operation and maintenance facility including a control room.

3.2.7 Ancillary Equipment

In addition to the key components outlined above, the WEF will also require:

- Meteorological masts;
- Security fencing; and
- CCTV monitoring equipment.

4 COMPLIANCE WITH THE EA

This section of the EMPr indicates compliance with the conditions (Table 4-1) and notes specific conditions (Section 4.2 – 6.6) of the EA, dated 26 October 2021 (DFFE Ref. 14/12/16/3/3/2/1029/1 and 14/12/16/3/3/2/1029/1/AM3), for which action is required on behalf of the Applicant and its Contractors/staff.

4.1 Compliance with the Conditions of the EA in the EMPr

Table 4-1: Compliance with the Conditions of the EA in the EMPr

EA Reference	EMPr Reference
17. The Environmental Management Programme (EMPr) submitted as part of the EIAr is not approved and must be amended to include measures as dictated by the final site layout map and micrositing and the provisions of this environmental authorisation. The EMPr must be made available for comments by the registered interested and affected parties and the holder of this environmental authorisation must consider such comments. Once amended, the final EMPr must be submitted to the Department for written approval prior to the commencement of the activity. Once approved the EMPr must be implemented and adhered to.	The EMPr has been updated (Version 2) to include measures as provided by specialists as a result of the micro-siting and final site walkthroughs. This EMPr will be made available for public review and comment for the required 30 period, after which the EMPr will be updated with any additional requirements and submitted to the Department for approval.
18. The EMPr amendment must include the following:	
18.1 The requirements and conditions of this authorisation.	This EMPr has been updated accordingly with the conditions of the authorisation.
18.2 All recommendations and mitigations measures recorded in the EIAr.	The EMPr has been updated with the recommendations and measure as recorded in the EIAr (Arcus, 2018) and the Amendment Reports (Arcus, 2019).

EA Reference	EMPr Reference
18.3. All mitigation measures as listed in the specialists reports within the EIAr.	The EMPr has been updated with the recommendations and measures as recorded in the specialists EIA reports (2017/2018), Amendment Reports (2019) and Site Walkthrough Reports (2021).
18.4. The final site layout map.	See Appendix A: Figure 3 and Figure 4.
18.5. Alien invasive management plan to the implemented during the construction and operation of the facility. The plan must include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken.	Section 12 - Alien Invasive Management Plan Section 13 – Alien Plant Management Plan
18.6. A plant rescue and protection plan which allows for the maximum transport of conservation important species from areas to be transformed. The plan must be compiled by a vegetation specialist familiar with the site in consultation with the ECO and be implemented prior to the commencement of construction.	Section 14 – Plant Rescue and Protection Plan Section 16 – Open Space Management Plan
18.7. A re-vegetation and habitat rehabilitation plan to be implemented during the construction and operation of the facility. Restoration must be undertaken as soon as possible after completion of the construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.	Section 15 – Revegetation and Habitat Rehabilitation Plan
18.8. A traffic management plan for site access roads to ensure no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted. This plant must include measures to minimise impacts on local commuters, e.g., limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time and avoid using roads through densely populated built up areas so as not to disturb existing retail and commercial operations.	Section 17 – Traffic Management Plan Section 18 – Transportation Management Plan
18.9. A construction and operational avifauna and bat monitoring plan.	Section 22 - Avifauna Management Plan Section 23 – Bat Management Plan
18.10. A heritage conservation management plan, which must have been submitted to SAHRA for review and comment.	Section 25 – Heritage Management Plan Submission to SAHRA for review and comment will take place as part of the PPP of the Final EMPr.

EA Reference	EMPr Reference
18.11. A storm water management plan to be implemented during the construction and operation of the facility. The plan must ensure compliance with the applicable regulations and prevent off site migration of contaminated storm water or increased soil erosion. The plan must include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of stormwater run-off.	Section 19 – Stormwater Management Plan
18.12. An erosion management plan for the monitoring and rehabilitating erosion events associated with the facility. Appropriate erosion mitigation must form part of this plan to prevent and reduce the risk of any potential erosion.	Section 20 – Erosion Management Plan
18.13. An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportations, handling, use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems.	Section 27 – Fuel Storage Measures
18.14. A fire management plan to be implemented during the construction and operational phases.	Section 21 – Fire Management Plan
18.15. Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams, and their catchments, and other environmental sensitive areas from construction impacts include the direct and indirect spillage of pollutants.	Section 27 – Fuel Storage Measures
18.16. An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.	See Appendix A: Figure 2 and Figure 4
18.17. A map combining the final layout map superimposed (overlain) on the environmental sensitivity map. This map must reflect the proposed location of the turbines as stated in the EIAr and this authorisation.	See Appendix A: Figure 4
19. The final amended EMPr (once approved) must be implemented and strictly enforced during all phases of the project. It shall be seen as a dynamic document and shall be included in all contract documentation for all phases of the development when approved.	
20. Changes to the approved EMPr must be submitted in accordance to the EIA Regulations applicable at the time.	

4.2 Frequency and Process of Updating the EMPr

- Condition 22: The EMPr must be updated where the findings of the environmental audit reports, contemplated in Condition 29 below, indicate insufficient mitigation of environmental impacts associated with the undertaking of the activity, or insufficient levels of compliance with the environmental authorisation or EMPr.

- Condition 23: The updated EMPr must contain recommendations to rectify the shortcomings identified in the environmental audit report.
- Condition 24: The updated EMPr must be submitted to the Department for approval together with the environmental audit report, as per Regulation 34 of GNR. 982. The updated EMPr must have been subjected to a public participation process, which process has been agreed to by the Department, prior to the submission to the updated EMPr to the Department for approval.
- Condition 25: In assessing whether to grant approval of an EMPr which has been updated as a result of an audit, the Department will consider the processes prescribed in Regulation 35 of GNR. 982. Prior to approving an amended EMPr the Department may request such amendments to the EMPr as it deems appropriate to ensure that the EMPr sufficiently provides avoidance, management, and mitigation of environmental impacts associated with the undertaking of the activity.
- Condition 26: The holder of the authorisation must request comments on the proposed amendments to the impact management outcomes of the EMPr or amendments to the closure objectives of the closure plan from potentially interested and affected parties, including the competent authority, by using any of the methods provided for in the Act for a period of at least 30 days.

4.3 Monitoring

Condition 27:

- The holder of the environmental authorisation must appoint an experienced Environmental Control Officer (ECO) for the construction phase of the development that will have the responsibility to ensure that the mitigation/ rehabilitation measures and recommendations referred to in this environmental authorisation are implemented and to ensure compliance with the provisions of the approved EMPr.
    - The ECO must be appointed before the commencement of any authorised activities.
    - Once appointed, the name and contact details of the ECO must be submitted to the Director: Compliance Monitoring of the Department.
    - The ECO must keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO.
    - The ECO must remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site is ready for operation.

4.4 Recording and Reporting to the Department

- Condition 28: All documentation e.g., audit /monitoring/compliance reports and notifications, required to be submitted to the Department in terms of this environmental authorisation, must be submitted to the Director: Compliance Monitoring of the Department.
- Condition 29: The holder of the environmental authorisation must for the period during which the environmental authorisation and EMPr remain valid, ensure that the project compliance with the conditions of the environmental authorisation and the EMPr are audited and the at the audit reports are submitted to the Director: Compliance Monitoring of the Department.
- Condition 30: The frequency of auditing and of submission of the environmental audit reports must be per the frequency indicted in the EMPr, taking into account the processes for such auditing as prescribed in Regulation 34 of GNR. 982.
- Condition 31: The holder of the environmental authorisation must, in addition, submit environmental audit reports to the Department within 30 days of completion of the construction phase (i.e., within 30 days of site handover) and a final environmental audit report within 30 days of completion of rehabilitation activities.

- Condition 32: The environmental audit reports must be compiled in accordance with Appendix 7 of the EIA Regulations 2014 an must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the environmental authorisation conditions as well as the requirements of the approved EMPr.
- Condition 33: Records relating to monitoring and auditing must be kept on site and made available for inspection to any relevant and competent authority in respect of this development.

4.5 Notification to Authorities

- Condition 34: A written notification of commencement must be given to the Department no later than fourteen (14) days prior to the commencement of the activity. Commencement for the purpose of this condition includes site preparation. The notice must include a date on which it is anticipated that the activity will commence, as well as a reference number.

4.6 Operation of the Activity

- Condition 35: A written notification of operation must be given to the department no later than fourteen (14) days prior to the commencement of the activity operational phase.

5 LEGAL FRAMEWORK

The San Kraal WEF EA, in terms of the NEMA, 1998, EIA Regulations, 2014, as amended, has been approved for the following listed activities.

Table 5-1: The NEMA,1998 EIA Regulations 2014, as amended, listed activities authorised for the San Kraal WEF

Listing Notices 1 - 3 07 April 2017	**Listed Activity**	**Project Description**
Listing Notice 1 GN R 327 Activity 11	*The development of facilities or infrastructure for the transmission and distribution of electricity— (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.*	The WEF will require transmission lines in order to connect to the grid. Electrical reticulation will be installed to transfer electricity from the turbines to an on-site substation. Cables will be installed underground where feasible.
Listing Notice 1 GN R 327 Activity 14	*The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic meters or more but not exceeding 500 cubic meters.*	Estimated volume of hazardous materials stored on site over a construction period of 24 months: construction phase 176.64 m^3 and operational phase 197.62 m^3.
Listing Notice 1 GN R 327 Activity 19	*The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;*	The construction of the WEF will include the excavation of soil in watercourses/drainage line areas, and infilling/deposition may exceed 5 cubic metres and, in some instances, may exceed 10 cubic metres. Borrow pits for the sourcing of aggregate material

Listing Notices 1 - 3 07 April 2017	Listed Activity	Project Description
		may be required. The construction of associated infrastructure, such as access tracks crossing watercourses may require excavation and/or infilling of watercourse areas.
Listing Notice 1 GN R 327 Activity 24	*The development of a road—* *(ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;*	Access roads will be required between turbines. These roads will be unsealed and will likely be between 8 - 14 m in width. The roads will be up to 14 m wide during construction, but will be reduced during operation.
Listing Notice 1 GN R 327 Activity 56	*The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre-* *(ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas.*	Existing farm access roads may need to be widened or lengthened. These roads would currently have no road reserve and will be wider than 8 meters in some areas.
Listing Notice 2 GN R 325 Activity 1	*The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more*	The WEF will consist of a number of wind turbines for electricity generation of more than 20 megawatts (up to 217 MW).
Listing Notice 2 GN 325 Activity 6	*The development of facilities or infrastructure for any process or activity which requires a permit or license or an amended permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent.*	The construction of the WEF may require a Water Use License in terms of the National Water Act, 1998 (Act No. 36 of 1998).
Listing Notice 2 GN 325 Activity 9	*The development of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kilovolts or more, outside an urban area or industrial complex.*	The construction of the 132 / 400 kV substation yard at the proposed Umsobomvu Substation.
Listing Notice 2 GN R 325 Activity 15	*The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for-* *the undertaking of a linear activity;* *maintenance purposes undertaken in accordance with a maintenance management plan.*	The construction of the WEF will require the clearance of approximately 150 hectares of vegetation in total across the site.

Listing Notices 1 - 3 07 April 2017	Listed Activity	Project Description
Listing Notice 3 **GN R 324** **Activity 4**	*The development of a road wider than 4 metres with a reserve less than 13,5 metres.* *a. Eastern Cape:* *i. Outside urban areas:* *(bb) National Protected Area Expansion Strategy Focus areas;* *g. Northern Cape* *Outside urban areas:* *(bb) National Protected Area Expansion Strategy Focus areas;* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;*	Internal and external access roads will be constructed, which are wider than 4 m. The site falls outside of an urban area and parts of the site fall within a National Protected Area Expansion Strategy Focus area and CBA in the Northern Cape.
Listing Notice 3 **GN R324** **Activity 12**	*The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.* *g. Northern Cape* *iii. Within critical biodiversity areas identified in bioregional plans*	The proposed development will require the clearance of natural vegetation in excess of 300 m^2 in areas of natural vegetation. A small portion of the WEF is located within a Critical Biodiversity Area in the Northern Cape.
Listing Notice 3 **GN R324** **Activity 18**	*The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.* *a. Eastern Cape:* *i. Outside urban areas:* *(bb) National Protected Area Expansion Strategy Focus areas;* *g. Northern Cape* *ii. Outside urban areas* *(bb) National Protected Area Expansion Strategy Focus areas;* *(ee) Critical biodiversity areas identified in systematic bioregional plans adopted by the competent authority or in bioregional plans*	Existing farm roads will need to be widened or lengthened. The site lies outside urban areas, and contains NPAES and CBAs in the Northern Cape and Eastern Cape. And the CBAs in the Northern Cape Section.

6 ENVIRONMENTAL MANAGEMENT PROGRAMME

This section forms the core of the EMPr and outlines the specific mitigation measures for the key impacts identified for the development of the San Kraal WEF.

6.1 Environmental Awareness and Compliance

The philosophy that has been used for the compilation of this management programme is derived from the principles of the NEMA, 1998, as amended, which states that a

development must be socially, economically and environmentally sustainable. Sustainable development requires that:

- The disturbance of ecosystems and loss of biodiversity are avoided (minimised or remedied);
- Pollution and degradation of the environment are avoided or minimised and remedied;
- Waste is avoided or minimised and re-used or re-cycled where possible and otherwise disposed of in a responsible manner;
- A risk averse and cautious approach is applied; and
- Negative impacts on the environment and on people's environmental rights be anticipated and prevented; and where they cannot altogether be prevented, are minimised and remedied.

The NEMA, 1998, as amended, makes provision that anyone who causes pollution or degradation of the environment is responsible for preventing impacts occurring, continuing or recurring and for the costs of repair of the environment.

6.2 Roles and Responsibilities

The developer, together with each appointed contractor and staff will be responsible for environmental management on site during the construction and operational phases of the proposed development. Specific roles and responsibilities are highlighted below.

Environmental Manager – Developer Representative

- Review and approve final EMPr prior to authorisation by the DFFE.
- Review and approve any EMPr updates or amendments post authorisation of the EMPr.
- Ensure environmental requirements are integrated into the project plans, method statements and tender processes.
- Support the environmental control officer (ECO) and environmental site officer (ESO) during the construction phase, to ensure implementation of the EMPr.
- Follow up and close out all environmental incidents and non-conformances.
- Appointment a suitably qualified independent ECO and ESO during the construction phase.

Environmental Control Officer

An independent ECO will work along-side the ESO to conduct the required inspections of the construction activities and EMPr implementation throughout the construction phase. After each monthly inspection, the ECO will produce a monitoring report that will be submitted to the Developer / Applicant, the DFFE, and any other person(s) if required. Relevant sections of the minutes of customary (monthly) site meetings will be attached to the monitoring report.

The Environmental Control Officer (ECO) will be responsible for overseeing the implementation of the EMPr during the construction and operations phases, and for monitoring, reviewing and verifying compliance of the ESO and contractor with the EMPr, record - keeping and updating of the EMPr as and when necessary.

The ECO will:

- Be fully knowledgeable with the contents of the EMPr;
- Be fully knowledgeable with the contents of all relevant environmental legislation and ensure compliance with them;
- Ensure that the contents of the EMPr are communicated to the contractor, all site staff, and the contractor and /or site manager are made aware of the contents of the EMPr, through presentations and discussions;

- Ensure that compliance to the EMPr is monitored by regular and comprehensive inspection of the site and surrounding areas; and
- Report on any incidents of non-compliance and ensure mitigation measures are implemented as soon as practical.

During *construction*, the Environmental Control Officer will be responsible for the following:

- Meeting on site with the Construction Manager and ESO prior to the commencement of construction activities to confirm the construction procedure and designated activity zones;
- Ensuring that daily / weekly (depending on the extent of construction activities, at any given time) monitoring of site activities take place by the ESO to ensure adherence to the specifications contained in the EMPr. The ESO should use a monitoring checklist that is to be prepared by an independent environmental assessment practitioner (EAP) at the start of the construction phase;
- Preparation of the monitoring report based on the site visits and feedback by the ESO;
- Conducting an environmental inspection on completion of the construction period and signing off the construction process with the Construction Manager and ESO; and
- Ensures that the ESO maintains an Incidents Register and Complaints Register on site.

During *operation*, the Environmental Control Officer will be responsible for:

- Overseeing the ESO during the implementation of the EMPr for the operation phase;
- Ensure that the necessary environmental monitoring takes place as specified in the EMPr;
- Update the EMPr and ensure that records are kept of all monitoring activities and results; and
- Ensures that the ESO maintains an Incidents Register and Complaints Register on site.

During *decommissioning*, the Environmental Control Officer will be responsible for:

- Overseeing the ESO during the implementation of the EMPr for the decommissioning phase; and
- Conducting an environmental inspection on completion of decommissioning and "signing off" the site rehabilitation process.

Environmental Site Officer

The Contractor must appoint a nominated representative of the contractor as the Environmental Site Officer (ESO) for the contract. The independent ESO is required to be on site at all times and will conduct the required inspections of the construction activities and ensure implementation of the EMPr throughout the construction phase. After each inspection, the ESO is required to submit a completed monitoring checklist to the ECO.

The Environmental Site Officer will be responsible for ensuring the implementation of the EMPr during the construction and operations phases by the contractor and providing feedback to the ECO regarding the compliance of the contractor with the EMPr and any updates required to the EMPr as and when necessary.

The ESO will:

- Be fully knowledgeable with the contents of the EMPr;
- Be fully knowledgeable with the contents of all relevant environmental legislation and ensure compliance with them;
- Ensure that the contents of the EMPr are implemented by the contractor, all site staff;
- Ensure that compliance to the EMPr is monitored by regular and comprehensive inspection of the site and surrounding areas; and

- Report on any incidents of non-compliance to the ECO and ensure mitigation measures are implemented as soon as practical.

Contractor

An independent contractor be responsible for the implementation of the EMPr in accordance with the requirements of the EA.

The Contractor will:

- Be fully knowledgeable with the contents of the EMPr;
- Ensure that the contents of the EMPr are understood by all site staff; and
- Report on any incidents of non-compliance to the ESO and ensure mitigation measures are implemented as soon as practical.

6.3 Training and Induction of Employees

The ECO has a responsibility to ensure that all personnel involved in the project are aware of and are familiar with the environmental requirements for the project. The EMPr shall be part of the terms of reference (ToR) for all contractors, sub-contractors and suppliers. All Contractors have to give some assurance that they understand the EMPr and that they will undertake to comply with the conditions therein. All senior and supervisory staff members shall familiarise themselves with the full contents of the EMPr. They shall know and understand the specifications of the EMPr and be able to assist other staff members in matters relating to the EMPr.

The ECO and / or ESO must ensure that all staff working on site have an environmental induction. The presentation can include the following topics:

- What is meant by "Environment"?
- Why the environment needs to be protected and conserved.
- How construction activities can impact on the environment.
- What can be done to militate against such impacts?
- Awareness of emergency and spills response provisions.
- Social responsibility during construction e.g., being considerate to local residents.

A detailed environmental management and training program must be developed. The purpose of this is to ensure that all staff and workers understand what is required of them. The main components of the program can incorporate the following:

- Concept of sustainability and the reasons for good environmental management and practice.
- Potential environmental impacts.
- Mitigation measures.
- Establishing a chain of responsibility and decision making.
- Specific training requirements of certain staff, and the potential hazardous associated with the job.
- Methodologies to be used for field sampling.
- Training in the use of field equipment.
- Training in identification of non-compliance situations and procedures to be followed in such instances.
- Reporting requirements.
- Healthy and Safety.
- Fire management.
- HIV/AIDS.

6.4 Complaints Register and Environmental Incidents Book

Any complaints received from the community must be brought to the attention of the ESO, who will respond accordingly.

The following information will be recorded:

- Time, date and nature of the complaint;
- Response and investigation undertaken; and
- Actions taken and by whom.

All complaints received will be investigated and a response (even if pending further investigation) will be given to the complainant within 7 days.

All environmental incidents occurring on the site will be recorded. The following information will be provided:

- Time, date, location and nature of the incident; and
- Actions taken and by whom.

6.5 Construction Environmental Monitoring

Environmental audits must be undertaken by the ECO, who acts as an independent environmental consultant, on a monthly basis, or what is deemed necessary by the ECO during times of heavy earth works and vegetation clearing, to ensure compliance with all aspects of the EMPr.

In order to facilitate communication between the Environmental Manager, the ECO and the ESO, it is vital that a suitable chain of command is structured that will ensure that the ECO's recommendations have the full backing of the project team before being conveyed to the Contractor. In this way, penalties as a result of non-compliances with the EMPr may be justified as failure to comply with instruction from the highest authority.

6.6 Dealing with Non-Compliance with the EMPr

There may be difficulties encountered with carrying out the mitigation measures within the EMPr, this may result in non-compliance with the EMPr. It may be possible that the contractor and or the developer put in place procedures to motivate staff members to comply with the EMPr and to deal with non-compliance. The developer must make this known to the contractor at the earliest stage possible, even during the tender phase. When dealing with non-compliance, the following process is recommended to take place:

- A notice of transgression should be issued to the transgressor;
- It must be documented in a designated register; and
- It must be reported in a monthly report and made available to I&APs and DFFE upon request.

7 DESIGN PHASE / PRE-CONSTRUCTION PHASE MITIGATION MEASURES

The objectives of the pre-construction phase are:

- To promote environmental awareness;
- To define roles and responsibilities for environmental management;
- To ensure suitable environmental training and induction to all contractors, sub-contractors and labourers; and
- To ensure that all legal obligations and contractual conditions have been met prior to commencing of construction.
- To ensure that the facility design responds to the identified environmental constraints and opportunities.
- To implement effective communication methods and practices.

7.1 Mitigation Measures for Legal Compliance

- Walkthrough of final layout to be undertaken by specialists as required in the EA, unless already completed.
- Appoint an independent ECO.
- Appoint an internal ESO to oversee day-to-day environmental activities.
- Staff should be educated as to the need to refrain from indiscriminate waste disposal and/or pollution of local soil and water resources and receive the necessary safety training.
- The contractor must ensure compliance with conditions described in the environmental authorisation.
- Confirm with ESO / ECO, suitable sites for the construction camps (equipment and batching etc.) and storage areas for materials. All construction equipment must be stored within this construction camp and all associated oil changes etc. (no servicing) must take place within this camp.
- Unskilled labourers should be drawn from the local market where possible, in line with the socio-economic mitigation measures.
- Environmental awareness training for site personnel, concerning the prevention of accidental spillage of hazardous chemicals and oil; pollution of water resources (both surface and groundwater), air pollution and litter control and identification of archaeological artefacts.
- The Contractor, together with the ESO shall ensure that the training and capabilities of the Contractor's site staff are adequate to carry out the designated tasks. Training developed by the Contractor and ESO must be approved by the ECO.
- Site personnel operating light, and heavy duty equipment (such as excavators, loaders, etc.) shall be adequately trained and sensitised to any potential hazards associated with their tasks.
- No operator shall be permitted to operate critical items of mechanical equipment without having been trained by the Contractor and certified competent by the Project Manager.
- No-go buffer zones must be made around the historical farm complexes.
- Maintain a 3.4 km turbine-free buffer zone around the Verreaux's Eagle nests located at -31.216572° 24.957244° and -31.219075° 24.970194.
- Comprehensive route assessment is recommended to take place by the Contractor as per the traffic management plan mitigation measures.
- Confirmation of approval by provincial / local road authority and permits must be sought by the Contractor.
- Permits and Approval of Plans, as recommended in this EMPr must be obtained, such as search and rescue, WUL, and SAHRA, etc.

7.2 Permit Requirements

Activities undertaken during site preparation, construction and operation may require additional permits, over and above the Environmental Authorisation. San Kraal Wind Power (Pty) Ltd is responsible for ensuring that they hold the necessary permits in order to comply with national and local regulations. Additional permit requirements which may be required are described below.

7.2.1 Borrow Pits

A borrow pit refers to an open pit where material (soil, sand or gravel rock) is removed for use at another location. San Kraal Wind Power (Pty) Ltd or their contractors may want to use borrow pits for certain earthworks operations, such as the construction of roads, embankments, bunds, berms, and other structures. Licenced borrow pits will be used to source material. There is an existing quarry on site which will be used, if possible.

The establishment of borrow pits is regarded as a mining activity and is legislated in terms of the Mineral and Petroleum Resources Development Act, 2002 (No. 28 of 2002) (MPRDA). A mining permit must be obtained from the Department of Minerals and Energy prior to the establishment of borrow pits on the site.

7.2.2 Water Use License

There are licensing procedures that need to be followed for particular "water uses". Water uses that may be of relevance to the development and associated road construction include the following:

- Taking of water from a water resource, including a water course, surface water, estuary or aquifer (i.e. borehole)
- Altering the bed, banks, course or characteristics of a water course; and/or
- Impeding or diverting of a flow in a water course.

Under the National Water Act, 1998 (Act No. 36 of 1998), a General Authorisation application is underway.

7.2.3 Heritage, Archaeology and Palaeontology

Should any heritage resources, including evidence of graves and human burials, archaeological material and paleontological material be discovered during the execution of the activities above, all works must be stopped immediately and heritage authorities must be notified without delay.

7.2.4 Vegetation Search and Rescue

Under the Forests Act, 1998 (Act No. 84 of 1998) (NFA), a license must be applied for from the Department of Agriculture, Forestry and Fisheries (DAFF) for the removal or disturbance of any protected trees on the site, in terms of the List of Protected Tree Species promulgated under the NFA.

7.3 Method Statements

Prior to construction, the developer must ensure that the ECO supply the following method statements:

- Vegetation clearing;
- Cement mixing;
- Hazardous waste management;
- Emergency preparedness and response;
- Hazardous spills clean up;
- Topsoil stockpiling management;
- Laydown area management; and
- Hazardous materials management.

7.4 Site Establishment

The object of site establishment is to ensure that an appropriate location is selected for the construction camp / site office and that the site office is managed in an environmentally responsible manner with minimal impact on the environment.

The optimised site layout (including the location of construction camps and laydown areas) must be finalised through a micro-siting process, which will include a detailed site assessment of the final site layout by various specialists as stipulated in the EA and this EMPr. As this has been completed, refer to Section 2.1, the layout is now being subject to a comment and review period, after which it will be submitted to the DFFE for approval.

7.4.1 Mitigation Measures

Before establishing the construction office areas, carefully plan the layout and develop a Construction Site Office Plan. The Construction Site Office Plan shall provide a description of the site and shall show, on a reasonably scaled map, the intended use of the site. Indicate and/or describe the location, size / quantity / capacity and design of:

- Access routes;
- Ablution facilities (including details on the handling of sewage and wastewater);
- On-site waste management facilities (waste containers, etc.);
- Design of bunds and other structures for containment of hazardous substances;
- Fencing;
- Water storage and supply;
- Power supply (for cooking, space heating, lighting, etc.);
- Fire extinguishers, first aid kit and any other relevant safety equipment;
- Emergency exit and gathering points for in case of an emergency;
- Other structures and buildings (offices, storerooms, workshops, etc.); and
- Other storage areas and stockpiles (i.e., topsoil, construction materials, equipment, etc.).

The following must also be undertaken:

- An area within the site must be demarcated for a construction site office, which will include storage area. This area must be fenced off.
- Site establishment shall take place in an orderly manner and all required amenities shall be installed at the laydown area before the main workforce move onto site.
- The construction camp shall have the necessary ablution facilities with chemical toilets at commencement of construction.
- The Contractor shall inform all site staff to make use of supplied ablution facilities and under no circumstances shall indiscriminate sanitary activities be allowed other than in supplied facilities.
- The Contractor shall supply waste collection bins and all solid waste collected shall be disposed of at a registered landfill.
- Potable water for use by on site workers must be made available on a daily basis at the site office and the working areas on site.
- A certificate of disposal shall be obtained by the Contractor and kept on file. Where a registered waste site is not available close to the construction site, the Contractor shall provide a method statement with regard to waste management.
- The disposal of waste shall be in accordance with all relevant legislation. Under no circumstances may solid waste be burnt or buried on site.
- Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes topics such as no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc.
- Apply for all relevant permits for abnormal loads and route clearances with the relevant authorities prior to construction.
- Appoint a qualified specialist to conduct a detailed site-specific Transport Risk Assessment during the detailed design phase and prior to construction.
- Determine the pre-construction condition of the road immediately prior to construction by carrying out a condition assessment or from recent pavement management system condition assessments if available from the Provincial Authorities.
- Public notices regarding any planned abnormal load transports must be placed at the construction site to inform affected parties.
- Abnormal loads must conform with legal maximum dimensions, and vehicles carrying abnormal loads must display sufficient signage.

- Any roads damaged during the transportation of components, or from other construction vehicles must be rehabilitated and returned to pre-construction conditions

7.5 Siting, Establishment and Management of Materials

- Choice of location for storage areas must take into account prevailing winds, distances to water bodies, general onsite topography and water erosion potential of the soil. Impervious surfaces must be provided where necessary.
- Mitigation measures as provided in this EMPr must be adhered to during site establishment.
- Storage areas must be designated, demarcated and fenced.
- Storage areas should be secure so as to minimize the risk of crime. They should also be safe from access by children / animals etc.
- Fire prevention facilities must be present at all storage facilities.
- Proper storage facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent the migration of spillage into the ground and groundwater regime around the temporary storage area(s).
- These pollution prevention measures for storage should include a bund wall high enough to contain at least 110% of any stored volume, and this should be sited away from drainage lines in a site with the approval of the Engineer.
- Any water that collects in the bund must not be allowed to stand and must be removed immediately and the hydrocarbon digestion agent within must be replenished.
- All legal compliance requirements with respect to Fuel storage and dispensing must be met.
- All fuel storage tanks (temporary or permanent) and associated facilities must be designed and installed in accordance with the relevant oil industry standards, SANS codes and other relevant requirements.
- Areas for storage of fuels and other flammable materials must comply with standard fire safety regulations[3].
- Flammable fuel and gas must be well separated from all welding workshops, assembly plants and loading bays where ignition of gas by an accidental spark may cause an explosion or fire.
- The tank must be erected at a safe distance from buildings, boundaries, welding sites and workshops and any other combustible or flammable materials.
- Symbolic safety signs depicting "No Smoking", "No Naked Flames" and "Danger" are to be prominently displayed in and around the fuel storage area.
- The capacity of the tank must be clearly displayed and the product contained within the tank clearly identified.
- There must be adequate fire-fighting equipment at the fuel storage and dispensing area or areas.
- The storage tank must be removed on completion of the construction phase of the project.
- All such tanks to be designed and constructed in accordance with the national standard for storage tanks, i.e., ISO 16961:2015 and a recognised international standard code if required.
- The rated capacity of tanks must provide sufficient capacity to permit expansion of the product contained therein by the rise in temperature during storage.
- Only empty and externally clean tanks may be stored on the bare ground. All empty and externally dirty tanks must be sealed and stored in an area where the ground has been protected.
- Any electrical or petrol-driven pump must be equipped and positioned so as not to cause any danger of ignition of the product.

[3] https://www.nfast.co.za/gallery/fire%20extinguisher%20regulations.pdf

- If fuel is dispensed from 200 litre drums, the proper dispensing equipment must be used.
- The drum must not be tipped in order to dispense fuel. The dispensing mechanism of the fuel storage tank must be stored in a waterproof container when not in use.
- All waste fuel and chemical impregnated rags must be stored in leak-proof containers and disposed of at an approved hazardous waste site.
- The amounts of fuel and chemicals stored on site must be minimised.
- Storage sites must be provided with bunds to contain any spilled liquids and materials.
- These storage facilities (including any tanks) must be on an impermeable surface that is protected from the ingress of storm water from surrounding areas in order to ensure that accidental spillage does not pollute local soil or water resources.
- Clear signage must be placed at all storage areas containing hazardous substances / materials.
- Material Safety Data Sheets (MSDSs) shall be readily available on site for all chemicals and hazardous substances to be used on site. Where possible the available, MSDSs should additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes.
- Storage areas containing hazardous substances / materials must be clearly signed.
- Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures.
- A suitable Waste Disposal Contractor must be employed to remove waste oil. These wastes should only be disposed of at licensed landfill sites designed to handle hazardous wastes.
- The contractor must ensure that its staff is made aware of the health risks associated with any hazardous substances used and has been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training.
- All excess cement and concrete mixes are to be contained on the construction site prior to disposal off site.
- Any spillage, which may occur, shall be investigated and immediate action must be taken.

7.6 Specific Environmental Authorisation Conditions

Conditions 37 – 139 in the EA, dated 26 October 2021 (DFFE Ref. 14/12/16/3/3/2/1029/1 and 14/12/16/3/3/2/1029/1/AM3) (Appendix F), are specific to the San Kraal WEF and must be implemented and adhered to.

7.7 Further Conditions

- All registered I&APs and key stakeholders of the Environmental Authorisation should be notified of opportunity and appeal procedure following receipt of approvals.
- DFFE must be notified prior to commencement of construction in accordance with the conditions of the EA.
- A health and safety plan in accordance with the Occupational Health & Safety Act must be developed prior to the commencement of construction to identify and avoid work related accidents.
- The Developer should endeavour to establish a recruitment and procurement policy which sets reasonable targets for the employment of South African and local residents /suppliers.
- A Code of Conduct must be developed for all workers directly related to the project. The objective of the code of conduct is to limit, where possible, social ills brought about by the construction and operation of the renewable energy facility.

Table 7-1: Design Phase Mitigation Measures

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
Geology, Soils and Agricultural Potential		
Loss of agricultural land Avoid areas under cultivation (if any)	Site engineer/ site contractor	Design Phase
Increased soil erosion hazard Once specific infrastructure sites are known, site specific measures can be devised for implementation and any potentially high risk sites can be identified.	Site engineer/ site contractor	Design Phase
Freshwater and Wetlands		
Loss of riparian systems and water courses during the construction phase of the WEF No vehicles to refuel or be maintained within drainage lines / riparian vegetation. Where possible culvert bases must be placed as close as possible with natural levels in mind so that these don't form additional steps / barriers. Any storm water within the site must be handled in a suitable manner, i.e. trap sediments and reduce flow velocities.	Site engineer/ site contractor	Design Phase
Impact on localized surface water quality mainly during the construction phase Strict use and management of all hazardous materials used on site. Strict management of potential sources of pollution (e.g., litter, hydrocarbons from vehicles & machinery, cement during construction, etc.). Strict control over the behaviour of construction workers. Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be strictly enforced. Appropriate ablution facilities should be provided for construction workers.	Site engineer/ site contractor	Design Phase
Flora and Terrestrial Fauna		

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
Impact on vegetation and listed plant species due to transformation within the development footprint Placement of turbines within the High Sensitivity areas and drainage lines must be avoided. Ensure that lay-down and other temporary infrastructure is within medium- or low-sensitivity areas. The assessed locations are considered acceptable, but should be rehabilitated after use. The exact routing of the roads should be adjusted where necessary to avoid features of higher sensitivity such as rocky outcrops, as informed by the preconstruction walk-though of the facility. Demarcate sensitive areas in close proximity to the development footprint as no-go areas with construction tape or similar and clearly mark as no-go area. If parts of the facility are to be fenced, then no electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences as they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of such fenced areas and not the outside.	Site engineer/ site contractor	Design Phase
Faunal impacts due to construction-phase noise and physical disturbance The illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the construction site. Fires within suitable dedicated containers (i.e., braai drums etc.) should only be allowed within the construction camp and similar demarcated and cleared areas and no fires should be allowed in the open veld as there is a risk of runaway veld fires. No fuelwood collection should be allowed on-site. No dogs or cats should be allowed on site apart from that of the landowners. If any parts of site such as construction camps must be lit at night, this should be done with low-UV type lights (such as most LEDs) as far as practically possible, which do not attract insects and which should be directed downwards. All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the	Site engineer/ site contractor	Design Phase

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
site should be cleaned up in the appropriate manner as related to the nature of the spill. No unauthorized persons should be allowed onto the site and site access should be strictly controlled. All construction vehicles should adhere to a low speed limit (40km/h for cars and 30km/h for trucks on unpaved roads) to avoid collisions with susceptible species such as snakes and tortoises and rabbits or hares. Speed limits should apply within the facility as well as on the public gravel access roads to the site. All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often needlessly persecuted.		
Avifauna		
Displacement of priority species due to construction activities at the wind development area Measures to control noise and dust should be applied according to current best practice in the industry. Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum. A 3.4 km turbine-free buffer zone should be implemented around the Verreaux's Eagle nests located at -31.216572° 24.957244° and -31.219075° 24.970194°.	Site engineer/ site contractor	Design Phase
Bats		
Bat Roost disturbance and/or destruction Designing the layout of the project to avoid areas that are more frequently used by bats may reduce the likelihood of mortality and should be the primary mitigation measure. Low lying areas, buildings, woodland/thicket and areas near water should be avoided. Turbine placement should only be in areas of Low-Medium and Medium bat sensitivity. No part of any turbine, including the rotor swept zone should be constructed within areas of Medium-High or High bat sensitivity.	Site engineer/ site contractor	Design Phase

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
If occupied roosts are confirmed these should be buffered based on best practise guidance.		
Heritage and Archaeology		
Do not disturb and old stone kraals or ruins, do not remove stone from walls, or artefacts from the earth or earth surface. Report any chance discoveries of human remains to an archaeologist or a heritage authority. Do not demolish without authority authorisation, ideally reuse old structures and cottages, care for the fabric but change it as little as possible.	Site engineer/ site contractor	Design Phase
Social Impacts		
Creation of local employment, training and business opportunities **Employment** Where reasonable and practical the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. Due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area. Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria. The proponent should meet with representatives from the ULM and IYLM to establish the existence of a skills database for the area. If such as database exists it should be made available to the contractors appointed for the construction phase. Where feasible a training and skills development programmes for local workers should be initiated prior to the initiation of the construction phase; The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. **Business** The proponent should liaise with the ULM and IYLM with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection	Site engineer/ site contractor	Design Phase

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work. Where possible, the proponent should assist local BBBEE companies to complete and submit the required tender forms and associated information. The ULM and IYLM, in conjunction with the local business sector and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project. *Note that while preference to local employees and companies is recommended, it is recognised that a competitive tender process may not guarantee the employment of local labour for the construction phase.*		
Impact of construction work on local communities Where possible the proponent should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories. The proponent should consider the need for establishing a Monitoring Forum (MF) in order to monitor the construction phase and the implementation of the recommended mitigation measures. The MF should be established before the construction phase commences, and should include key stakeholders, including representatives from the ULM and IYLM, farmers and the contractor(s). The MF should also be briefed on the potential risks to the local community and farm workers associated with construction workers. The proponent and the contractor(s) should, in consultation with representatives from the MF, develop a code of conduct for the construction phase. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation.	Site engineer/ site contractor	Design Phase
Influx of job seekers The proponent should implement a "locals first" policy, specifically with regard to unskilled and low skilled opportunities. The proponent should implement a policy that no employment will be available at the gate and or in the local towns in the area (except for local residents).	Site engineer/ site contractor	Design Phase

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
Risk to safety, livestock, farm infrastructure and farming operations The proponent should consider the option of establishing a MF (see above) that includes local farmers and develop a Code of Conduct for construction workers. This committee should be established prior to commencement of the construction phase. The Code of Conduct should be signed by the proponent and the contractors before the contractors move onto site.	Site engineer/ site contractor	Design Phase
Increased fire risk The proponent should enter into an agreement with the local farmers in the area whereby losses associated with fires that can be proven to be associated with the construction activities for the WEF will be compensated for. The agreement should be signed before the construction phase commences.	Site engineer/ site contractor	Design Phase
Impact associated with loss of farmland The location of wind turbines, access roads, laydown areas etc. should be informed by the findings of the soil and vegetation study. In this regard areas of high potential agricultural and sensitive vegetation soils should be avoided. The developer should consult with affected property owners in order to enable them to factor construction activities into their farming schedules. The location of wind turbines, access roads, laydown areas etc. should be discussed with the locally affected landowner in the finalisation process and inputs provided should be implemented in the layout as best as possible. The footprint areas for the establishment of individual wind turbines should be clearly demarcated prior to commencement of construction activities. All construction related activities should be confined to the demarcated area and minimised where possible.	Site engineer/ site contractor	Design Phase
General Mitigation Measures		
Portable toilets must be supplied to the workforce in areas of activity. A licenced contractor must be appointed by the contractor to provide this facility, and ensure that wastes are correctly disposed of. Servicing must take place regularly, proof of which must be retained on site by the contractor	Site engineer/ site contractor	Design Phase
Health and Safety		

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
Implementation of safety measures, work procedures and first aid must be implemented on site. Workers should be thoroughly trained in using potentially dangerous equipment. Contractors must ensure that all equipment is maintained in a safe operating condition. A safety officer must be appointed. A record of health and safety incidents must be kept on site. Any health and safety incidents must be reported to the project manager immediately. First aid facilities must be available on site at all times. The contractor must ensure that all construction workers are well educated about HIV/ AIDS and the risks surrounding this disease. The location of the local clinic where more information and counselling are offered must be indicated to workers. Material stockpiles or stacks, such as, pipes must be stable and well secured to avoid collapse and possible injury to site workers / local residents. Personal Protective Equipment (PPE) must be made available to all construction staff and their usage must be compulsory. Hard hats and safety shoes must be worn at all times and other PPE worn were necessary i.e., dust / masks, ear plugs etc.	Site engineer/ site contractor	Design Phase

8 CONSTRUCTION PHASE MITIGATON MEASURES

The developer is to ensure that the contractor complies with all mitigation measures during the construction period. The major sources of potential impacts include, the turbine footprint construction, the construction of buildings and infrastructure, the construction of roads and bridges, and vehicle operation, and spillages.

The following is not allowed on site:

- No poaching of any animals or harvesting of any flora;
- No construction camp, for workforce accommodation is allowed on site; contractors are to ensure suitable housing for staff outside of the proposed development footprint.
- No cooking or fires allowed on site; and
- No alcohol or drugs are allowed on site.

8.1 Potential Construction Phase Impacts

The following impacts are likely to occur during the construction of the proposed WEF. Specific mitigation measures for each impact are presented in the table below.

- The accidental, negligent, or deliberate spillage or inappropriate disposal of hazardous substances could result in air, soil and water pollution and may affect the health and well-being of people, plants and animals.
- Excessive noise could be made by the construction activity which would affect neighbouring communities.
- Potential damage to the soil structure, soil compaction and loss of soil fertility.
- Loss of the vegetation cover and increased erosion risks.
- Dust related problems.
- Safety hazards to the public, workers and animals in the area.
- Disturbance to local hydrology from construction activities.
- Pollution of surface water bodies.
- Dust can be a nuisance to the construction workforce and to the public and can negatively affect the growth and recovery rate of plants. Potential sources of fugitive dust include, but are not limited to:
  - Demolition of concrete foundations and existing buildings;
  - Grading / movement of soil;
  - Transportation and unloading of construction materials;
  - Vehicular movement over unsurfaced roads and tracks; and,
  - Wind erosion of stockpiles.
- Construction activities will result in the exposure of the soil to erosive factors, i.e., wind and water, and the compaction of the soil in other areas.
- Illegal poaching and collection of animals and plant material.
- Loss of established indigenous and exotic habitat.
- Unnecessary trampling of vegetation and harm to animals.
- Degradation of the scenic quality due to the major earthworks and any unsightly structures.
- Damage or loss of important cultural, historical or pre-historical sites and artefacts.
- Damage to existing roads and tracks, power lines, pipelines, etc.
- Dangerous conditions near road.
- Trespassing and illegal access onto land.

Table 8-1: Construction Phase Mitigation Measures

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
Geology, Soils and Agricultural Potential		
Loss of agricultural land Avoid areas under cultivation (if any)	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Increased soil erosion hazard Minimize vegetation removal to the smallest possible footprint. Control possible runoff by using soil conservation and soil retention measures, especially on steep slopes. Store any removed topsoil for later use (contains indigenous seeds etc.) and re-vegetate as soon as possible. Top material should exclude litter, building rubble, alien plant material or any other waste. All topsoil, and specifically any topsoil from areas which are likely to contain bulbs, must be stripped and stockpiled for re-use in rehabilitated areas. This will constitute at least a 300mm layer. Topsoil shall be stored in areas demarcated by the ECO and Engineer and in piles not higher than 2m, and may not be removed from site, or used for any purpose other than in the rehabilitation of the site post-construction. The stockpiles shall not be compacted or disturbed, and shall be domed at the top to promote runoff. The period between the stockpiling of topsoil and its utilization shall be as short as possible, and ideally the topsoil should be transferred to its intended site of use immediately following site clearance and stockpiling. This would also avoid double handling. Stockpiles that are to be stored for less than three months should be covered with shade-cloth or Geotech fabrics or similarly suitable material to prevent erosion. If stockpiles are to be stored for more than 3 months a protective vegetation layer must be established to cover topsoil stockpiles in order to protect them against erosion and desiccation. Vegetation may not consist of weeds, but must comprise grass or ground covers.	Site engineer/ site contractor ESO to monitor	Throughout construction Weekly checks

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
Once specific infrastructure sites are known, site specific measures can be devised for implementation and any potentially high risk sites can be identified.		
Freshwater and Wetlands		
Loss of riparian systems and water courses during the construction phase of the WEF No construction may take place within 32 m of a watercourse, with the exception of water course crossings. Where water course crossings are required, the engineering team must provide effective means to minimise the potential upstream and downstream effects of sedimentation and erosion (erosion protection) as well minimise the loss of riparian vegetation (small footprint). If several the transmission line towers for the grid need to be located within some of the watercourses, then this must be carried out in collaboration with an aquatic specialist during the micro siting process. No vehicles to refuel or be maintained within drainage lines / riparian vegetation. Where possible culvert bases must be placed as close as possible with natural levels in mind so that these don't form additional steps / barriers. Increase in sedimentation and erosion within the development footprint during the construction phase and to a lesser degree the operational phase. Any storm water within the site must be handled in a suitable manner, i.e. trap sediments and reduce flow velocities.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Weekly checks
Impact on localized surface water quality mainly during the construction phase Strict use and management of all hazardous materials used on site. Strict management of potential sources of pollution (e.g., litter, hydrocarbons from vehicles & machinery, cement during construction, etc.). Containment of all contaminated water by means of careful run-off management on the development site. Strict control over the behaviour of construction workers.	Site engineer/ site contractor ESO to monitor	Throughout construction Weekly checks

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be and strictly enforced. Appropriate ablution facilities should be provided for construction workers during construction of the facility.		
Flora and Terrestrial Fauna		
Impacts on vegetation and listed or protected plant species resulting from construction activities Placement of turbines within the High Sensitivity areas and drainage lines must be avoided. Ensure that lay-down and other temporary infrastructure is within medium- or low-sensitivity areas. The assessed locations are considered acceptable, but should be rehabilitated after use. Minimise the development footprint as far as possible and rehabilitate disturbed areas that are no longer required by the operational phase of the development. The exact routing of the roads should be adjusted where necessary to avoid features of higher sensitivity such as rocky outcrops, as informed by the preconstruction walk-though of the facility. Demarcate sensitive areas in close proximity to the development footprint as no-go areas with construction tape or similar and clearly mark as no-go area. If parts of the facility are to be fenced, then no electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences as they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of such fenced areas and not the outside.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Weekly checks
Alien Plant Invasion Wherever excavation is necessary, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species. Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented. Problem woody species such	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
as *Prosopis* are already present in the area and are likely to increase rapidly if not controlled. Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as there are also likely to be prone to invasion problems. Regular alien clearing should be conducted, as needed, using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.		
Faunal impacts due to construction-phase noise and physical disturbance During construction any fauna directly threatened by the construction activities should be removed to a safe location by the ESO / ECO or other suitably qualified person. The illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the construction site. Fires within suitable dedicated containers (i.e., braai drums etc.) should only be allowed within the construction camp and similar demarcated and cleared areas and no fires should be allowed in the open veld as there is a risk of runaway veld fires. No fuelwood collection should be allowed on-site. No dogs or cats should be allowed on site apart from that of the landowners. If any parts of site such as construction camps must be lit at night, this should be done with low-UV type lights (such as most LEDs) as far as practically possible, which do not attract insects and which should be directed downwards. All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. No unauthorized persons should be allowed onto the site and site access should be strictly controlled. All construction vehicles should adhere to a low speed limit (40km/h for cars and 30km/h for trucks on unpaved roads) to avoid collisions with susceptible species such as snakes and tortoises and rabbits or hares. Speed limits should apply within the facility as well as on the public gravel access roads to the site.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Weekly checks

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often needlessly persecuted.		
Avifauna		
Displacement of priority species due to construction activities at the wind development area Restrict the construction activities to the construction footprint area. Do not allow any access to the remainder of the property during the construction period. Measures to control noise and dust should be applied according to current best practice in the industry. Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum. A 3.4 km turbine-free buffer zone should be implemented around the Verreaux's Eagle nests located at -31.216572° 24.957244° and -31.219075° 24.970194°. The appointed Environmental Control Officer (ECO) should be adequately trained in identifying signs that indicate possible avifauna breeding by priority species. The ECO must then, during audits/site visits, make a concerted effort to look out for such breeding activities of such species, and such efforts may include the training of construction staff to identify such species, followed by regular questioning of staff as to the regular whereabouts on site of the species. If any priority species are confirmed to be breeding (e.g., if a nest site is found), construction activities within 500m of the breeding site must cease, and the avifaunal specialist should be contacted immediately for further assessment of the situation and instruction on how to proceed.	Site engineer/ site contractor ESO to monitor ECO to implement Specialist	Upon commencement Throughout construction Weekly checks
Bats		
Destruction of bat roosts due to earthworks and blasting Adhere to the sensitivity map during turbine placement. Blasting should be minimised and used only when necessary.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Loss of foraging habitat	Site engineer/ site contractor	Upon commencement

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
Adhere to the sensitivity map. Keep to designated areas when storing building materials, resources, turbine components and/or construction vehicles and keep to designated roads with all construction vehicles. Damaged areas not required after construction should be rehabilitated by an experienced vegetation succession specialist.	ESO to monitor	Throughout construction Monthly checks
Noise		
Night-time construction of the Access Roads Where possible, do not allow night-time construction activities located within 800 m from potential noise-sensitive receptors.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Daily checks
Noise from day time construction traffic Where possible relocate access roads to be further than 60 m from dwellings occupied by people (during construction period) to reduce the significance of noise from construction traffic during the day.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Daily checks
Noise from night-time construction traffic Where possible relocate access roads to be further than 140 m from dwellings occupied by people (noise level below 42 dBA). Minimize or eliminate night-time traffic that may pass within 140 m (ideally) from noise-sensitive receptors for a noise impact of low significance.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Daily checks
Visual		
Impact of access roads and cabling Carefully plan to reduce the construction period. Minimise vegetation clearing and rehabilitate cleared areas as soon as possible. If this is not practical and the entire site is cleared at the start of the contract, it is to be stabilized immediately to control dust. Cleared vegetative material is not to be dumped anywhere other than an approved waste disposal site or an area as agreed to with the ECO.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Daily checks

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
Maintain a neat construction site by removing rubble and waste materials regularly. Make use of existing gravel access roads where possible. Where possible, fewer but larger turbines with a greater output should be utilised rather than a larger number of smaller turbines with a lower capacity. If blade painting is required, turbines should be painted plain white, as this is a less industrial colour (Vissering, 2011). Bright colours or obvious logos should not be permitted. Turbines should be repaired promptly, as they are considered more visually appealing when the blades are rotating (or at work) (Vissering, 2011). If required, turbines should be replaced with the same model, or one of equal height and scale. Repeating elements of the same height, scale and form can result in unity and lessen the visual impact that would typically be experienced in a chaotic landscape made up of diverse colours, textures and patterns (Vissering, 2011). Light fittings for security at night should reflect the light toward the ground and prevent light spill. Ensure that dust suppression techniques are implemented on all access roads. All reinstated cable trenches should be re-vegetated with the same vegetation that existed prior to the cable being laid. Make use of existing gravel access roads where possible. Light fittings for security at the on-site switching station at night should reflect the light toward the ground and prevent light spill. Cables should be buried underground where possible. The operation and maintenance buildings should be painted with natural tones that fit with the surrounding environment. Non-reflective surfaces should be utilised where possible.		
Heritage		
Impacts to Archaeological Heritage Do not disturb and old stone kraals or ruins, do not remove stone from walls, or artefacts from the earth or earth surface. Report any chance discoveries of human remains to an archaeologist or a heritage authority.	Site engineer/ site contractor ESO to monitor Specialist	Upon commencement Throughout construction Monthly checks

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
Moderate mitigation requirements have been identified that involve the avoidance of, or professional collection of archaeological material from archaeological sites. The packed stone 'wolwehok' (JG036) will be affected by the construction of SK13 and a 30 buffer must be cordoned off during construction activities and treated as a no-go area by WEF staff and contractors.		
Impacts to Colonial Period Heritage Do not disturb and old stone kraals or ruins, do not remove stone from walls, or artefacts from the earth or earth surface. Do not demolish without authority authorisation, ideally reuse old structures and cottages, care for the fabric but change it as little as possible.	Site engineer/ site contractor ESO to monitor Specialist	Upon commencement Throughout construction Monthly checks
Impacts to cultural landscape and setting If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt / Phillip Hine 021 462 5402) must be alerted. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase / Mimi Seetelo 012 320 8490), must be alerted immediately. A professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA.	Site engineer/ site contractor ESO to monitor Specialist	Throughout construction Monthly checks
Palaeontology		
Impacts to Palaeontology Safeguarding of chance fossil finds (preferably *in situ*) during the construction phase by the responsible ECO, followed by reporting of finds to the responsible heritage management authority (SAHRA). The monitoring of 10% of excavations into bedrock as per SAHRA guideline. The avoidance of any buffer zones as recommended by the palaeontologist.	Site engineer/ site contractor ESO to monitor Specialist	Throughout construction Monthly checks

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
Recording and judicious sampling of significant chance fossil finds by a qualified palaeontologist, together with pertinent contextual data (stratigraphy, sedimentology, taphonomy) within the final footprint. Curation of fossil material within an approved repository (museum / university fossil collection) by a qualified palaeontologist.		
Socio-Economic		
Creation of local employment, training and business opportunities **Employment** The local authorities, relevant community representatives and local farmers should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project.	Contractor	Upon commencement Throughout construction Monthly checks
Impact of construction workers on local communities The proponent and contractor (s) should implement an HIV/AIDS awareness programme; employment equity awareness and discuss discrimination policy with all construction workers at the outset of the construction phase. The contractor should provide transport to and from the site on a daily basis for low and semi-skilled construction workers. This will enable the contractor to effectively manage and monitor the movement of construction workers on and off the site. Where necessary, the contractors should make the necessary arrangements to enable low and semi-skilled workers from outside the area to return home over weekends and/ or on a regular basis. This would reduce the risk posed to local family structures and social networks. It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.	Developer Contractor	Upon commencement Throughout construction Monthly checks
Risk to safety, livestock, farm infrastructure and farming operations The proponent should consider to enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase proven to be associated with the construction activities for the WEF will be compensated for. The agreement should be signed before the construction phase commences.	Developer Contractor ECO / ESO	Upon commencement Throughout construction Monthly checks

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
Contractors appointed by the proponent should provide daily transport for workers to and from the site. This would reduce the potential risk of trespassing on the remainder of the farm and adjacent properties. The proponent should hold contractors liable for compensating farmers in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the proponent, the contractors and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below). Contractors appointed by the proponent must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms. Contractors appointed by the proponent must ensure that construction workers who are found guilty of trespassing, stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation. The housing of construction workers on the site should be limited to security personnel.		
Increased fire risk Contractor should ensure that open fires on the site for cooking or heating are not allowed except in designated areas. No smoking should be permitted on site, except in designated areas. Contractor should ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy summer months. Contractor to provide adequate fire-fighting equipment on- site. Contractor to provide fire-fighting training to selected construction staff. No construction staff, with the exception of security staff, to be accommodated on site overnight.	Developer Contractor ECO / ESO	Upon commencement Throughout construction Monthly checks

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
As per the conditions of the Code of Conduct, in the event of a fire proven to be caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also consider to compensate the fire-fighting costs borne by farmers and local authorities.		
Impacts associated with construction vehicles As far as possible, the transport of components to the site along the N10 and N9 should be planned to avoid weekends and holiday periods. The contractor should inform local farmers and representatives from the ULM and IYLM Tourism of dates and times when abnormal loads will be undertaken. The contractor must ensure that damage caused by construction related traffic to internal farm roads is repaired on a regular basis throughout the construction phase. The costs associated with the repair must be borne by the contractor. Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis, adhering to speed limits and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers. All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits. The Contractor should ensure that workers are informed that no waste can be thrown out of the windows while being transported to and from the site. Workers who throw waste out windows should be fined. The Contractor should be required to collect waste along the road reserve on a weekly basis. Waste generated during the construction phase should be transported to the local landfill site. EMP measures (and penalties) should be implemented to ensure farm gates are closed at all times. EMP measures (and penalties) should be implemented to ensure speed limits are adhered to at all times.	Developer Contractor ECO / ESO	Upon commencement Throughout construction Monthly checks
Impact associated with loss of farmland All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the	Developer Contractor ECO / ESO	Upon commencement Throughout construction Monthly checks

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
construction phase. The rehabilitation plan should be informed by input from the soil scientist and discussed with the local farmer. The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The implementation of the Rehabilitation Programme should be monitored by the ESO / ECO. All workers should receive training/ briefing on the reasons for and importance of not driving in undesignated areas. The contractor can consider penalties for construction vehicles who may not adhere to the use of designated roads and speed limit on site. Disturbance footprints should be reduced to the minimum. Compensation should be paid by the developer to farmers that suffer a permanent loss of land due to the establishment of the WEF. Compensation should be based on accepted land values for the area.		

8.2 Post Construction

- Once construction has been completed on site and all excess material has been removed, the storage area shall be rehabilitated. If the area was badly damaged, re- seeding shall be done and fencing in of the area shall be considered if livestock/faunal species specific to the area may subsequently have access to such an area.
- Such areas shall be rehabilitated to their natural state. Any spilled concrete shall be removed and soil compacted during construction shall be ripped, levelled and re-vegetated.
- Only designated areas must be used for storage of construction materials, soil stockpiles, machinery and other equipment.
- Specific areas must be designated for cement/concrete mixing/ batching plants. Sufficient drainage for these plants must be in place to ensure that soils do not become contaminated.
- The construction camp must be kept clear of litter at all times.
- Spillages within the construction camp need to be cleaned up immediately and disposed of in the hazardous skip bin for correct disposal.
- All remaining material including building rubble and waste are to be removed from the site.
- All areas disturbed should be managed to ensure efficient drainage.
- The area designated for the deposition of spoil material is to be levelled and shaped to ensure the efficient drainage of the site. Under no circumstances is general or hazardous waste to be disposed of at this site.

8.2.1 Infrastructure

- Disassemble all temporary infrastructure units and remove components from the working areas and contractors camp. This will include storage structures and containers, water storage container, power supply, workers accommodation, sewage systems.
- Drain all potable chemical toilets, being careful not to spill the contents. Transfer the waste to an appropriate disposal site.
- Drain all waste water and sewage associated with temporary ablution facilities and transfer the waste to an appropriate disposal site to be identified by the contractor.
- Disassemble all fencing around the camp and either sell, suction or donate to the local community or transfer the waste components to a disposal site or the contractor's base.
- Do not leave any components, waste or infrastructure units within the working area and camp unless specifically required for the operation and maintenance phases and as agreed by the ESO / ECO.

8.2.2 Contaminate Substrate and Pollution Control Structures

- Excavate all areas of contaminated substrate, transfer the contaminated substrate to an appropriate disposal site and treat the affected areas.
- Remove all plastic linings used for pollution control and transfer to an appropriate disposal site.
- Break up all concrete structures that have been created and remove concrete waste to an appropriate disposal site.

8.2.3 Waste

- Remove all remaining construction materials from the camp and working areas and either sell, auction, donate to the local community or transfer the waste components to a disposal site or the contractor's base.
- Remove all construction debris, litter and domestic waste from the camp and working areas and transfer to an appropriate disposal site.
- Remove all waste receptacles from the camp and working areas and either sell, auction, donate to the local community or transfer the waste components to a disposal site or the contractor's base.

9 OPERATIONAL PHASE MITIGATION MEASURES

Once the construction and commissioning of the WEF is completed the project becomes operational. The operator of the WEF has the responsibility to ensure that the mitigation measures proposed for the operational phase of the WEF is implemented and conducted appropriately. The main impacts associated with the operation phase of the WEF relate to birds and bats. A bird and bat specialist must be appointed to undertake the operational phase monitoring as per the EA and according to the applicable bird and bat guidelines at the time of commercial operations. Section 22 and 23 provides a guide to the plan required to be implemented.

Displacement of priority bird species due to habitat destruction during operational lifetime of the wind energy facility phase is likely to be a medium negative impact but will be reduced to a low level with the application of mitigation measures. Species most likely to be affected by the habitat destruction (particularly fragmentation) are the terrestrial species such as Blue Crane, Ludwig's Bustard, Secretarybird and Grey-winged Francolin. The rehabilitation of disturbed areas will help to mitigate the impact of the habitat transformation to some extent, but the fragmentation of the habitat due to the construction of the internal road network cannot be mitigated, and will remain an impact for the duration of the operational life-time of the facility.

Collisions of priority species with the turbines in the operational phase are likely to be a medium negative impact and it could be reduced to a low negative level through the application of mitigation measures. Species most likely to be at risk of collision with the turbines are Lesser Kestrel, Martial Eagle, Verreaux's Eagle and Jackal Buzzard. The impact is likely to persist for the operational life-time of the project. Implementation of the proposed mitigation measures should reduce the probability and severity of the impact on priority species to such an extent that the overall significance should be reduced to low.

Mortality of priority species with the grid connection and internal medium voltage network due to collisions in the operational phase is likely to be of medium significance, and will remain as such after the implementation of mitigation measures.

It is recommended that bat curtailment be applied from the start of operation at Level 3 on all turbines for every night of the year from dusk until dawn. Should robust and scientifically defendable data gathered during the operational study phase reveal higher bat mortalities than currently anticipated, the mitigations should be applied to the turbines identified as causing the highest impacts.

During operation of the development, the large majority of the WEF sites will continue with agricultural use as it is currently. The only development related activities on-site will be routine servicing and unscheduled maintenance. The noise impact from maintenance activities is insignificant, with the main noise source being the wind turbine blades and the nacelle (components inside).

Although noise and disturbance levels during operation will be significantly reduced compared to construction, some noise and disturbance impacts will persist due to operational activities on the wind farm as well as noise generated by the turbines themselves. Due to the low significance of a noise impact, no routine noise measurement programme is recommended. Measurement locations, frequencies and procedures are provided (Section 24) as a guideline for the developer to consider should there be a noise complaint.

As the affected areas are not considered to be very high faunal sensitivity and there are no species of very high sensitivity present, the post-mitigation operational impacts on fauna are likely to be of low significance.

During the operational life of the wind farm, it is expected that physical impacts to heritage will diminish or cease. Impacts to intangible heritage are expected to occur. Such impacts relate to changes to the feel, atmosphere and identity of a place or landscape. Such changes are evoked by visual intrusion, noise, changes in land use and population density. In the case of this project there are no inhabited structures with or close to the project area therefore these impacts will not apply.

The developer has the responsibility to ensure that all operational mitigation measures outlined in this document, and all revisions thereof, are complied with.

Table 9-1: Operational Phase Mitigation Measures

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
Freshwater and Wetlands		
Impact on riparian systems through the possible increase in surface water runoff from hard surfaces and or new road crossings on riparian form and function Any storm water within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities. This is particularly important due to the levels of erosion already observed within the affected catchments.	Site engineer/ site contractor ESO to monitor	Throughout operation
Increase in sedimentation and erosion within the development footprint during the construction phase and to a lesser degree the operational phase During the operational phase, monitor culverts to see if erosion issues arise and if any erosion control is required. Appropriate ablution facilities should be provided for on-site staff during the operation of the facility.	Site engineer/ site contractor ESO to monitor	Throughout operation
Flora and Terrestrial Fauna		
Faunal impacts due to operational activities Management of the site should take place within the context of an Open Space Management Plan. No unauthorized persons should be allowed onto the site. Any potentially dangerous fauna such snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location. The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden by anyone except landowners or other individuals with the appropriate permits and permissions where required. If the site must be lit at night for security purposes, this should be done with downward- directed low-UV type lights (such as most LEDs) as far as possible, which do not attract insects. All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the	Site engineer/ site contractor ESO to monitor	Throughout operation

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
site should be cleaned up in the appropriate manner as related to the nature of the spill. All vehicles accessing the site should adhere to a low speed limit (40km/h max on unpaved road) to avoid collisions with susceptible species such as snakes and tortoises.		
Soil Erosion Risk Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan. All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance, as per the Erosion Management and Rehabilitation Plans for the project. All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. All cleared areas should be revegetated with indigenous perennial shrubs and grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.	Site engineer/ site contractor ESO to monitor	Throughout operation
Alien Plant Invasion Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as there are also likely to be prone to invasion problems. Regular alien clearing should be conducted, as needed, using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible	Site engineer/ site contractor ESO to monitor	Throughout operation
Avifauna		
Displacement of priority species due to habitat destruction at the wind development site	Site engineer/ site contractor ESO to monitor Specialist	Throughout operation

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken and to this end a habitat restoration plan is to be developed by a rehabilitation specialist.		
Direct mortality of priority species due to collisions with the turbines at the wind development area Once the turbines have been constructed, post- construction monitoring should be implemented to compare actual collision rates with predicted collision rates. The avifaunal specialist, in consultation with external experts and relevant NGO's such as BLSA, should determine annual mortality thresholds for priority species anticipated to be at risk of collision mortality, prior to the wind farm going operational. If actual collision rates exceed the pre- determined threshold levels, curtailment of turbines should be implemented for high risk situations. A 150 m no-turbine set-back buffer zone (infrastructure is allowed) is required around the escarpment to minimise the risk of collisions for slope soaring species. Care should be taken not to create habitat for prey species that could draw priority raptors into the area and expose them to collision risk. Rock piles must be removed from site or covered with topsoil to prevent them from becoming habitat for Rock Hyrax (Dassie).	Site engineer/ site contractor ESO to monitor Specialist	Throughout operation As indicated by the post construction monitoring programme
Bats		
Bat mortalities due to direct blade impact or barotrauma during foraging activities (not migration) Adhere to operational mitigation measures that may be deemed necessary during the operational monitoring assessment, if any is required.	Site engineer/ site contractor ESO to monitor Specialist	Throughout operation As indicated by the post construction monitoring programme
Artificial Lighting If possible, utilise lights with wavelengths that attract less insects (low thermal/infrared signature). Lights should be switched off when not in use or equipped with passive motion sensors.	Site engineer/ site contractor ESO to monitor	Throughout operation
Socio-Economic		

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
Development of renewable energy infrastructure and impact on tourism Implement a skills development and training programme aimed at maximizing the number of employment opportunities for local community members. Maximise opportunities for local content, procurement and community shareholding. Establish a visitor centre.	Site engineer/ site contractor ESO to monitor	Throughout operation
Creation of employment and business opportunities and support for local economic development The proponent should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's and locals employed during the operational phase of the project. The proponent, in consultation with the ULM and IYLM, should investigate the options for the establishment of a Community Development Trust.	Developer O&M Contractor ESO to monitor	Throughout operation First 5 years of operation
Benefits associated with the establishment of a Community Trust The ULM and IYLM should be consulted as to the structure and identification of potential trustees to sit on the Trust. The key departments in the ULM and IYLM that should be consulted include the Municipal Managers Office, IDP Manager and LED Manager. Clear criteria for identifying and funding community projects and initiatives in the area should be identified. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community. Strict financial management controls, including annual audits, should be instituted to manage the funds generated for the Community Trust from the WEF.	Developer O&M Contractor ESO to monitor	Throughout operation
Generate income for affected landowners Implement agreements with affected landowners.	Developer O&M Contractor ESO to monitor	Throughout operation

10 CUMULATIVE IMPACTS MITIGATION MEASURES

10.1 Geology

The likelihood of cumulative impacts is small. Only if other developments (whether wind farms or not) were to occur, using the same access roads and thereby increasing potential soil erosion aspects, would cumulative impacts need to be considered.

10.2 Freshwater and Wetlands

Overall cumulative impact during the construction and operational phases mitigation measures is to reduce residual risk or enhance opportunities by improving the current stormwater and energy dissipation features not currently found along the tracks and roads within the region and installing properly sized culverts with erosion protection measures at the present road / track crossings.

10.3 Flora and Terrestrial Fauna

The current layout has been arrived at through iteration of various layouts and takes account of the sensitive features identified and mapped, as such, the development footprint will minimize impact on the high sensitivity areas and is considered to represent an acceptable mitigated layout. Further refinement of the layout can occur with turbine micro-siting at the preconstruction phase to minimize impact on local features such as rocky outcrops. There should be an integrated management plan for the development area during operation, which is beneficial to fauna and flora.

10.4 Avifauna

Cumulative impacts on avifauna are displacement of priority species due to construction activities at the wind development area; mortality of priority species due to electrocution associated with the internal medium voltage MV powerlines; direct mortality of priority species due to collisions with the turbines at the wind development area; displacement of priority species due to dismantling activities at the wind development area; and direct mortality of priority species due to collisions with the internal medium voltage MV lines and the 132kV grid connection powerline. The mitigation measures to reduce residual risk or enhance opportunities is to ensure that all the proposed mitigation measures for the San Kraal Split 1 WEF detailed above must be implemented and all the proposed mitigation measures proposed for the other renewable energy facilities within a 35 km radius should be implemented to reduce the cumulative impact. Developers and operators of the facilities must ensure that these mitigation measures are implemented.

10.4.1 Mitigation Measures

All proposed mitigation measures for Construction, Operational and Decommissioning Impact Phases of the San Kraal Split 1 WEF should be implemented:

- Restrict the construction activities to the construction footprint area.
- Do not allow any access to the remainder of the property during the construction period.
- Measures to control noise and dust should be applied according to current best practice in the industry.
- Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.
- Implement a 500 m no development buffer zone around each of the two pans at FP3 at 31°14'15.02"S 25° 2'44.17"E and FP4 at 31°13'55.42"S 25° 2'50.37"E to protect the pair of Blue Cranes from disturbance.
- A 3.4 km no-go buffer is implemented around the Verreaux's Eagle nest at FP1 (31°12'59.66"S 24°57'26.08").

- The appointed Environmental Control Officer (ECO) should be trained in identifying signs that indicate possible breeding by priority species. The ECO must then, during audits/site visits, make a concerted effort to look out for such breeding activities of such species, and such efforts may include the training of construction staff to identify such species, followed by regular questioning of staff as to the regular whereabouts on site of the species. If any priority species are confirmed to be breeding (e.g. if a nest site is found), construction activities within 500m of the breeding site must cease, and the avifaunal specialist should be contacted immediately for further assessment of the situation and instruction on how to proceed.
- The final powerline design and associated electrocution mitigation measures (if necessary) must be approved and signed off by the avifaunal specialist.
- The recommendations of the specialist ecological study must be strictly adhered to.
- Maximum used should be made of existing access roads and the construction of new roads should be kept to a minimum.
- Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken and to this end a habitat restoration plan is to be developed by a rehabilitation specialist.
- Once the turbines have been constructed, post-construction monitoring should be implemented to compare actual collision rates with predicted collision rates.
- The avifaunal specialist, in consultation with external experts and relevant NGO's such as BLSA, should determine annual mortality thresholds for priority species anticipated to be at risk of collision mortality, prior to the wind farm going operational.
- If actual collision rates exceed the pre-determined threshold levels, curtailment of turbines should be implemented for high risk situations.
- A 150 m no-turbine set-back buffer zone (infrastructure is allowed) is required around the escarpment to minimise the risk of collisions for slope soaring species.
- Care should be taken not to create habitat for prey species that could draw priority raptors into the area and expose them to collision risk. Rock piles must be removed from site or covered with topsoil to prevent them from becoming habitat for Rock Hyrax (Dassie).
- Restrict the dismantling activities to the footprint area.
- Do not allow any access to the remainder of the property during the dismantling period.
- Measures to control noise and dust should be applied according to current best practice in the industry.
- Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.

10.5 Bats

Cumulative impacts on bat mortalities due to direct blade collision or barotrauma during foraging on resident and migrating bats can be mitigated by adhering to recommended mitigation measures during the operational phase study; applying and adhering to project specific mitigations and the sensitivity map during any further turbine layout revisions; avoid placements of turbines in bat sensitive areas and their buffers; lastly the high sensitivity valley areas can serve as commuting corridors for bats in the larger area, potentially lowering the cumulative effects of several WEF's in an area if the valley areas are avoided during turbine placement and are well buffered.

10.6 Visual

Large construction vehicles and equipment during the construction phase of the San Kraal Split 1 WEF will contribute further to the alteration of the natural character of the study area and will also expose a greater number of visual receptors to visual impacts associated with the construction phase. The construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. Vehicles and trucks travelling to and from the proposed San Kraal development site on gravel access roads are

also expected to result in an increase in dust emissions in the greater area. The increased traffic on these roads and the dust plumes could create a greater visual impact within the greater area and may evoke more negative sentiments from surrounding viewers. Surface disturbance during construction of the San Kraal Split 1 WEF would also result in a greater amount of bare soil being exposed which could result in a greater visual contrast with the surrounding environment. In addition, temporary stockpiling of soil during construction may alter the landscape further. Wind blowing over these disturbed areas could result in a greater amount of dust which would have a visual impact. The following should be implemented by all developers in the cumulative region assessed:

- Carefully plan to reduce the construction period.
- Minimise vegetation clearing and rehabilitate cleared areas as soon as possible.
- Vegetation clearing should take place in a phased manner.
- Maintain a neat construction site by removing rubble and waste materials regularly.
- Make use of existing gravel access roads, where possible.
- Limit the number of vehicles and trucks travelling to and from the proposed San Kraal development site, where possible.
- Ensure that dust suppression techniques are implemented on all access roads.
- Ensure that dust suppression is implemented in all areas where vegetation clearing has taken place.
- Ensure that dust suppression techniques are implemented on all soil stockpiles.
- Temporarily fence-off the construction sites (for the duration of the construction period).
- All reinstated cable trenches should be re-vegetated with the same vegetation that existed prior to the cable being laid, where possible.
- It is not realistic to attempt to screen wind farms visually. Providing a means whereby they can be absorbed into the landscape is more feasible. This can be approached by making use of certain materials and finishes and by presenting the scheme to I&APs.
- Institute a rigorous planting regime around certain boundaries of the project site, for example, the substations, the buildings, and the N10 and N9 transportation routes.
- Buildings and similar structures must be in keeping with regional planning policy documents, especially the principles of critical regionalism (namely sense of place, sense of history, sense of nature, sense of craft and sense of limits).

The San Kraal Split 1 WEF development and its associated infrastructure could exert a visual impact by further altering the visual character of the surrounding area and exposing a greater number of sensitive visual receptor locations to visual impacts. The operation of the San Kraal Split 1 WEF in addition to the other nearby renewable energy developments may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. Maintenance vehicles may need to access the San Kraal WEF development and its associated infrastructure via gravel access roads and are expected to increase dust emissions in the surrounding area in doing so. The increased traffic on the gravel roads and the dust plumes could create a greater visual impact within the surrounding area and may evoke more negative sentiments from surrounding viewers. It should however be noted that the existing roads which can be found around the project site also appear to be gravel. As such, the gravel access roads are not expected to contribute significantly to the overall cumulative visual impact. Security and operational lighting at San Kraal Split 1 WEF development and its associated infrastructure could result in a greater amount of light pollution and glare within the surrounding area, which could be a significant annoyance to surrounding viewers.

- Where possible, fewer but larger turbines with a greater output should be utilised rather than a larger number of smaller turbines with a lower capacity.
- Medium-high visual impact zones should be viewed as zones where the number of turbines should be limited, where possible.
- Light fittings for security at night should reflect the light toward the ground (except for aviation lighting) and prevent light spill.

- The operations and maintenance buildings should not be illuminated at night, if possible.
- If blade painting is required, turbines should be painted plain white, as this is a less industrial colour (Vissering, 2011). Bright colours or obvious logos should not be permitted.
- Turbines should be repaired promptly, as they are considered more visually appealing when the blades are rotating (or at work) (Vissering, 2011).
- The operation and maintenance buildings should be painted with natural tones that fit with the surrounding environment. Non-reflective surfaces should be utilised where possible.
- If required, turbines should be replaced with the same model, or one of equal height and scale. Repeating elements of the same height, scale and form can result in unity and lessen the visual impact that would typically be experienced in a chaotic landscape made up of diverse colours, textures and patterns (Vissering, 2011).
- As far as possible, limit the number of maintenance vehicles, which are allowed to access the sites.
- Bury cables under the ground where possible.
- Ensure that dust suppression techniques are implemented on all access roads.
- Select the alternatives that will have the least impact on visual receptors.

10.7 Heritage

The cumulative impact on heritage is the risk of accumulative damage to the National Estate. Given the lack of information at present, it is difficult to judge success of mitigation and therefore the degree of accumulative impact that has taken place. Methods must be developed by heritage authorities, to assess the success of mitigation, within renewable energy projects.

10.8 Social

The final placement of wind turbines associated with the proposed WEF should be discussed with the affected landowners and the recommendations of the VIA should be implemented.

The establishment of a number of renewable energy facilities has the potential to place pressure on local services, specifically medical, education and accommodation. The Northern and Eastern Cape Provincial Government, in consultation with the ULM and IYLM and the proponents involved in the development renewable energy projects in the ULM and IYLM area should consider establishing a Development Forum to co- ordinate and manage the development and operation of renewable energy projects in the area, with the specific aim of mitigating potential negative impacts and enhancing opportunities. This would include identifying key needs, including capacity of existing services, accommodation and housing and the implementation of an accredited training and skills development programmes aimed at maximising the opportunities for local workers to be employed during the construction and operational phases of the various proposed projects. These issues should be addressed in the Integrated Development Planning process undertaken by the ULM and IYLM.

The establishment of a number of renewable energy facilities in the region will create employment, skills development and training opportunities, creation of downstream business opportunities. The proposed establishment of suitably sited renewable energy facilities within the ULM and IYLM should be supported.

10.9 Wake Effect Analysis

On the 01 July 2020, 3E compiled a wake effect impact analysis to calculate the impact that the San Kraal WEF would have the on the operational Noupoort Wind Farm. The report was based on the amended WEF layout and specifications (i.e., 35 wind turbines with 170

m rotor diameter and 115 m hub height). Following the appointment of San Kraal WEF as a preferred bidder in Round 5 of the REIPPPP, the Developer commissioned 3E to update the wake effect impact analysis that was conducted for the project, based on the final wind turbine layout and specifications (i.e., 26 wind turbines with 165 m rotor diameter and 124 m hub height). The change of layout (i.e., reduction of the number of turbines and rotor diameter) result in a reduction of the wake effect impact from 1.1 % of turn over to 0.87 % of turn over (i.e., 20.9 % reduction in impact).

11 DECOMMISSIONING PHASE

Should the WEF be decommissioned a decommissioning plan must be produced. The plan must include details on the decommissioning and dismantling of the WEF, taking in consideration the potential environmental impact associated with it. Environmental monitoring plans must be produced so ensure no pollution occurs during this phase. The plan must include the steps that will be taken to rehabilitate the area after the WEF is dismantled, as well as recycling options of the equipment and structures.

The following mitigation measures must be implemented, should the development be decommissioned. These measures must be continuously updated through the operational phase of the development.

Table 11-1: Decommissioning Phase Mitigation Measures

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
Freshwater and Wetlands		
Impact on riparian systems through the possible increase in surface water runoff from hard surfaces and or new road crossings on riparian form and function Any storm water within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities. This is particularly important due to the levels of erosion already observed within the affected catchments.	Site engineer/ site contractor ESO to monitor	Throughout decommissioning
Flora and Terrestrial Fauna		
Faunal impacts due to decommissioning phase activities Any potentially dangerous fauna such as snakes or fauna threatened by the decommissioning activities should be removed to a safe location prior to the commencement of decommissioning activities. All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises. No excavated holes or trenches should be left open for extended periods as fauna may fall in and become trapped. All above-ground infrastructure should be removed from the site. Below-ground infrastructure such as cabling can be left in place if it does not pose a risk, as removal of such cables may generate additional disturbance and impact, however, this should be in accordance with the facilities' decommissioning and recycling plan, and as per the agreements with the land owners concerned.	Site engineer/ site contractor ESO to monitor	Throughout decommissioning
Following decommissioning, the site will be highly vulnerable to soil erosion	Site engineer/ site contractor ESO to monitor Developer to implement	Throughout decommissioning 2 years post decommission

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
Any roads that will not be rehabilitated should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. There should be regular monitoring for erosion for at least 2 years after decommissioning by the Developer to ensure that no erosion problems develop as result of the disturbance, and if they do, to immediately implement erosion control measures. All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. All disturbed and cleared areas should be revegetated with indigenous perennial shrubs and grasses from the local area.		
Alien Plant Invasion following decommissioning Wherever excavation is necessary for decommissioning, topsoil should be set aside and replaced after decommissioning activities are complete to encourage natural regeneration of the local indigenous species. Due to the disturbance at the site alien plant species are likely to be a long-term problem at the site following decommissioning and regular control will need to be implemented until a cover of indigenous species has returned. Regular monitoring for alien plants within the disturbed areas for at least two years after decommissioning or until alien invasive species are no longer a problem at the site. Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.	Site engineer/ site contractor ESO to monitor Developer to implement	Throughout decommissioning 2 years post decommission
Avifauna		
Displacement of priority species due to dismantling activities at the wind development area Restrict the dismantling activities to the footprint area. Do not allow any access to the remainder of the property during the dismantling period. Measures to control noise and dust should be applied according to current best practice in the industry.	Site engineer/ site contractor ESO to monitor	Throughout decommissioning

Potential Impact and Proposed Mitigation Measures	Responsibility	Frequency
Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.		
Socio-Economic		
Loss of jobs and associated income The proponent should ensure that retrenchment packages are provided for all staff retrenched when the WEF is decommissioned. All structures and infrastructure associated with the proposed facility should be dismantled and transported off-site on decommissioning; The proponent should investigate the option of establishing an Environmental Rehabilitation Trust Fund to cover the costs of decommissioning and rehabilitation of disturbed areas. The Trust Fund should be funded by a percentage of the revenue generated from the sale of energy to the national grid over the 20 year operational life of the facility. The rationale for the establishment of a Rehabilitation Trust Fund is linked to the experiences with the mining sector in South Africa and failure of many mining companies to allocate sufficient funds during the operational phase to cover the costs of rehabilitation and closure. Alternatively, the funds from the sale of the WEF as scrap metal should be allocated to the rehabilitation of the site.	Site engineer/ site contractor Developer to implement ESO to monitor	During decommissioning

12 ALIEN INVASIVE MANAGEMENT PLAN

12.1 Purpose of the Alien Invasive Management Plan

The purpose of the San Kraal WEF Alien Invasive Management Plan is to provide a framework for the management of alien and invasive plant species during the construction and operation of the San Kraal Wind Energy Facility. The broad objectives of the plan include the following:

- Ensure alien plants do not become dominant in parts or the whole site through the control and management of alien and invasive species presence, dispersal and encroachment.
- Initiate and implement a monitoring and eradication programme for alien and invasive species.
- Promote the natural re-establishment and planting of indigenous species in order to retard erosion and alien plant invasion.

12.2 Problem Outline

Alien plants replace indigenous vegetation leading to severe loss of biodiversity and change in landscape function. Potential consequences include loss of biodiversity, loss of grazing resources, increased fire risk, increased erosion, loss of wetland function, impacts on drainage lines, increased water use etc.

In addition, the Conservation of Agricultural Resources Act (Act 43 of 1983), as amended in 2001, requires that land users clear Declared Weeds from their properties and prevent the spread of declared invader plants

Table 3 of CARA (the Conservation of Agricultural Resources Act) lists all declared weeds and invader plants. Alien plants are divided into 3 categories based on their risk as an invader.

- Category 1 - These plants must be removed and controlled by all land users. They may no longer be planted or propagated and all trade in these species is prohibited.
- Category 2 – These plants pose a threat to the environment but nevertheless have commercial value. These species are only allowed to occur in demarcated areas and a land user must obtain a water use licence as these plants consume large quantities of water.
- Category 3 – These plants have the potential of becoming invasive but are considered to have ornamental value. Existing plants do not have to be removed but no new plantings may occur and the plants may not be sold.

The following guide is a useful starting point for the identification of alien species: Bromilow, C. 2010*. Problem Plants and Alien Weeds of South Africa. Briza,* Pretoria.

12.3 Vulnerable Ecosystems and Habitats

Certain habitats and environments are more vulnerable to alien plant invasion and are likely to bear the brunt of alien plant invasion problems at the site. In addition, construction activities and changes in water distribution at the site following construction are also likely to increase and alter the vulnerability of the site to alien plant invasion.

Areas at the site which are likely to require specific attention include the following:

- Wetlands, drainage lines and other mesic areas.
- Cleared and disturbed areas such as road verges, crane pads and construction footprints etc.

- Construction camps and lay-down areas which are cleared or are active for an extended period.

12.3.1 Wetlands, drainage lines and other mesic areas

There are a number of drainage lines at the site. Disturbance within these areas often results in alien plant invasion on account of the greater water and nutrient availability in this habitat. Although there are no turbines within such areas, numerous road crossings will be required. The disturbance footprint within such areas should be minimized and these areas should be checked for alien species more than the surrounding landscape.

12.3.2 Cleared and disturbed areas

Cleared and disturbed areas are clearly vulnerable to invasion on account of the lack of existing plant cover to resist invasion as well as the disturbance created during construction which promoted the germination and establishment of alien plant species.

12.3.3 Construction camps and laydown areas

Construction camps and lay down areas are either cleared of vegetation or prolonged activities in these areas result in negative impact on indigenous vegetation. In addition, repeated vehicle and human activity in these areas usually results in the import of alien plant seed on clothes, dirty vehicles or with construction machinery and materials.

12.4 General Clearing and Guidance Principles

Alien control programs are long-term management projects and should include a clearing plan which includes follow up actions for rehabilitation of the cleared area. Alien problems at the site should be identified during pre-construction surveys of the development footprint. This may occur simultaneously to other required surveys. The clearing plan should then form part of the pre-construction reporting requirements for the site.

The plan should include a map showing the alien density & indicating dominant alien species in each area.

- Lighter infested areas should be cleared first to prevent the build-up of seed banks.
- Pre-existing dense mature stands ideally should be left for last, as they probably won't increase in density or pose a greater threat than they are currently.
- Collective management and planning with neighbours may be required in the case of large woody invaders as seeds of aliens are easily dispersed across boundaries by wind or water courses.
- All clearing actions should be monitored and documented to keep track of which areas are due for follow-up clearing.

12.5 Clearing Methods

- Different species require different clearing methods such as manual, chemical or biological methods or a combination of both.
- However, care should be taken that the clearing methods used do not encourage further invasion. As such, regardless of the methods used, disturbance to the soil should be kept to a minimum. Fire is not a natural phenomenon in the area and fire should not be used for alien control or vegetation management at the site.
- The best-practice clearing method for each species identified should be used. The preferred clearing methods for most alien species can be obtained from the DWAF Working for Water Website http://www.dwaf.gov.za/wfw/Control/.

12.6 Use of Herbicide for Alien Control

Although it is usually preferable to use manual clearing methods where possible, such methods may create additional disturbance which stimulates alien invasion and may also be ineffective for many woody species which re-sprout. Where herbicides are to be used, the impact of the operation on the natural environment should be minimised by observing the following:

- Area contamination must be minimised by careful, accurate application with a minimum amount of herbicide to achieve good control.
- All care must be taken to prevent contamination of any water bodies. This includes due care in storage, application, cleaning equipment and disposal of containers, product and spray mixtures.
- Equipment should be washed where there is no danger of contaminating water sources and washings carefully disposed of in a suitable site.
- To avoid damage to indigenous or other desirable vegetation, products should be selected that will have the least effect on non-target vegetation.
- Coarse droplet nozzles should be fitted to avoid drift onto neighbouring vegetation.
- The appropriate health and safety procedures should also be followed regarding the storage, handling and disposal of herbicides.

For all herbicide applications, the following guidelines should be followed:

Working for Water: Policy on the Use of Herbicides for the Control of Alien Vegetation.

13 ALIEN PLANT MANAGEMENT PLAN

13.1 Construction Phase Activities

The following management actions are aimed at reducing soil disturbance during the construction phase of the development, as well as reducing the likelihood that alien species will be brought onto site or otherwise encouraged.

Construction Phase Action	Frequency
The ECO is to provide permission prior to any vegetation being cleared for development.	Daily
Clearing of vegetation should be undertaken as the work front progresses – mass clearing should not occur unless the cleared areas are to be surfaced or prepared immediately afterwards.	Weekly
Where cleared areas will be exposed for some time, these areas should be protected with packed brush, or appropriately battered with fascine work. Alternatively, jute (Soil Saver) may be pegged over the soil to stabilise it.	Weekly
Cleared areas that have become invaded can be sprayed with appropriate herbicides provided that these are such that break down on contact with the soil. Residual herbicides should not be used.	Weekly
Although organic matter is frequently used to encourage regrowth of vegetation on cleared areas, no foreign material for this purpose should be brought onto site. Brush from cleared areas should be used as much as possible. The use of manure or other soil amendments is likely to encourage invasion.	Weekly
Clearing of vegetation is not allowed within 32 m of any wetland, 80 m of any wooded area, within 1:100 year floodlines, in conservation servitude areas or on slopes steeper than 1:3, unless permission is granted by the ECO for specifically allowed construction activities in these areas	Weekly
Care must be taken to avoid the introduction of alien plant species to the site and surrounding areas. (Particular attention must be paid to imported material such as building sand or dirty earth-moving equipment.) Stockpiles should be checked regularly and any weeds emerging from material stockpiles should be removed.	Weekly

Construction Phase Action	Frequency
Alien vegetation regrowth on areas disturbed by construction must be controlled throughout the entire site during the construction period.	Monthly
The alien plant removal and control method guidelines should adhere to best-practice for the species involved. Such information can be obtained from the DWAF Working for Water website.	Monthly
Clearing activities must be contained within the affected zones and may not spill over into demarcated No Go areas.	Daily
Pesticides may not be used. Herbicides may be used to control listed alien weeds and invaders only	Monthly
Wetlands and other sensitive areas should remain demarcated with appropriate fencing or hazard tape. These areas are no-go areas (this must be explained to all workers) that must be excluded from all development activities.	Daily

13.1.1 Monitoring Actions for the Construction Phase

Monitoring Action	Indicator	Timeframe
Document alien species present at the site	List of alien species	Pre-construction
Document alien plant distribution	Alien plant distribution map within priority areas	3 Monthly
Document & record alien control measures implemented	Record of clearing activities	3 Monthly
Review & evaluation of control success rate	Decline in documented alien abundance over time	Biannually

13.2 Operational Phase Activities

The following management actions are aimed at reducing the abundance of alien species within the site and maintaining non-invaded areas clear of aliens.

Operational Phase Action	Frequency
Surveys for alien species should be conducted regularly. Every 6 months for the first two years after construction and annually thereafter. All aliens identified should be cleared.	Every 6 months for 2 years and annually thereafter
Where areas of natural vegetation have been disturbed by construction activities, revegetation with indigenous, locally occurring species should take place where the natural vegetation is slow to recover or where repeated invasion has taken place following disturbance.	Biannually, but revegetation should take place at the start of the rainy season
Areas of natural vegetation that need to be maintained or managed to reduce plant height or biomass, should be controlled using methods that leave the soil protected, such as using a weed-eater to mow above the soil level.	When necessary
No alien species should be cultivated on-site. If vegetation is required for aesthetic purposes, then non-invasive, water-wise locally-occurring species should be used.	When necessary

13.2.1 Monitoring Actions for the Operational Phase

Monitoring Action	Indicator	Timeframe
Document alien species distribution and abundance over time at the site	Alien plant distribution map	Biannually
Document alien plant control measures implemented & success rate achieved	Records of control measures and their success rate. A decline in alien distribution and cover over	Quarterly
Document rehabilitation measures implemented and success achieved in problem areas	Decline in vulnerable bare areas over time	Biannually

13.3 Decommissioning Phase Activities

The following management actions are aimed at preventing the invasion, by alien plant species, of the re-vegetated areas created during the decommissioning phase. Re-vegetation of the disturbed site is aimed at approximating as near as possible the natural vegetative conditions prevailing prior to operation.

Decommissioning Phase Action	Frequency
All damaged areas shall be rehabilitated if the infrastructure is removed and the facility is decommissioned	Once off
All natural areas must be rehabilitated with species indigenous to the area. Re-seed with locally-sourced seed of indigenous grass species that were recorded on site pre-construction.	Once off, with annual follow up re-vegetation where required
Maintain alien plant monitoring and removal programme for 3 years after rehabilitation.	Biannually

13.3.1 Monitoring Actions for the Decommissioning Phase

Monitoring Action	Indicator	Timeframe
Monitor newly disturbed areas where infrastructure has been removed to detect and quantify any aliens that may become established for 3 years after decommissioning and rehabilitation	Alien plant surveys and distribution map	Biannually until such time as the natural vegetation has recovered sufficiently to resist invasion.
Monitor re-vegetated areas to detect and quantify any aliens that may become established for 3 years after decommissioning and rehabilitation	Alien plant surveys and distribution map	Biannually for 3 years
Document alien plant control measures implemented & success rate achieved	Records of control measures and their success rate. A decline in alien distribution and cover over time at the site	Annually for 3 years

14 PLANT RESCUE AND PROTECTION PLAN

The purpose of the plant rescue and protection plan is to implement avoidance and mitigation measures to reduce the impact of the development on listed and protected plant species and their habitats. The preconstruction walk-through of the site has refined the list of species identified for search and rescue, as well as locate such species prior to construction (see Appendix D).

The objective of rescuing plants on the project area is to prevent the loss of species either directly or through future extinction and minimising impacts of development on population dynamics of species of conservation concern.

Preserving the natural configuration of habitats as part of ecosystems, thus ensuring a diverse but stable hydrology, substrate and general environment for species to be able to become established and persist.

14.1 Effect of Removing Individual Species of Conservation Concern

Species of conservation concern are declining either due to overexploitation or because their range of occupancy is limited and further infringed on by development. Most plant populations require a certain minimum number of individuals within a population or metapopulation to allow for sufficient genetic transfer between individuals. This prevents genetic erosion and hence weakening of the ability of individuals to persist in their environments. Similarly, where the distance between metapopulations is significantly increased due to fragmentation and the resultant loss of some populations, populations may suffer genetic decline due to restricted movement of pollen. Pollinators or other species that depend on a particular plant species for a specific microhabitat or food source may be equally affected because of the reduction of available resources. Therefore, the aim of plant rescue actions is always to maintain as many individuals of a plant population in as close proximity to the original habitat as possible to minimise loss of individuals and fragmentation of populations to prevent the creation of future extinction debts of the development.

14.2 Plant Rescue and Protection

Successful plant rescue can only be achieved if:

- Species can be removed from their original habitat with minimal damage to the plant, especially the roots.
- All plants removed are safely stored and treated according to their specific requirements prior to being transplanted again.
- They are relocated into a suitable habitat and protected from further damage and all disturbances to aid their re-establishment.
- Timing of planting activities is planned with the onset of the growing season.
- Steps are taken where necessary to aid the initial establishment of vegetation, including occasional watering.

14.3 Timing of Planting

- All planting shall be carried out as far as is practicable during the period most likely to produce beneficial results (i.e., during the peak growing season), but as soon as possible after completion of a section of earthworks.
- Drainage line rehabilitation preparation must be done during autumn, and planting of appropriate species in these areas should commence during early spring after the first rains.

14.4 Plant Search and Rescue

Prior to construction, once all the areas where topsoil will be removed or areas will be transformed have been demarcated, the contractor will be responsible to remove all bulbous species from the topsoil, as well as succulents and small indigenous shrubs that can be transplanted. These are to be kept in a raised, protected position in a designated area until they can be replanted again as part of the rehabilitation process. Further details are listed in the Re-vegetation and Habitat rehabilitation Plan.

15 RE-VEGETATION AND HABITAT REHABILITATION PLAN

The Revegetation and Habitat Rehabilitation Plan addresses the need to mitigate all impacts leading to disturbed vegetation, loss of species and/or agricultural potential, disturbed soil surfaces, and generally bare soils prone to erosion and further degradation on the proposed development site. The plan overlaps to some degree with the Erosion Management Plan, and for successful rehabilitation, it is imperative that this plan is at all times used in conjunction with other EMPs mentioned.

The objective of the plan is therefore to provide:

- Protocols for the removal, temporary storage and replanting of plant species of conservation concern Protocols for the rehabilitation of vegetative cover across the project area.
- Tools for planning the rehabilitation work and responding to unforeseen events Guidelines on implementation and post-implementation tasks Criteria for evaluating rehabilitation success.
- A summary of items to be included in the rehabilitation budget to ensure that there is sufficient allocation of resources on the project budget so that the scale of EMPr-related activities is consistent with the significance of project impacts.

The objective of the revegetation and rehabilitation of the area is:

- Preventing the loss of species either directly or through future extinction and minimising impacts of development on population dynamics of species of conservation concern.
- Preserving the natural configuration of habitats as part of ecosystems, thus ensuring a diverse but stable hydrology, substrate and general environment for species to be able to become established and persist.
- Preserving or re-creating the structural integrity of natural plant communities. Actively aid the improvement of indigenous biodiversity according to a desirable end state according to a previously recorded reference state. This reference state, if healthy, will be dynamic and able to recover after occasional disturbances without returning to a degraded state.
- Improving the ecosystem function of natural landscapes and their associated vegetation.
- Successful rehabilitation can only be achieved with: »A long-term commitment »Practical, adaptive management »Viable goals of desired outcomes.

Prior to vegetation rehabilitation, all stakeholders involved should be consulted to determine:

- What the rehabilitation is ultimately aiming for – rehabilitation of cropping/grazing lands or rehabilitation of indigenous vegetation, after soil erosion and storm water management is in place and IAPs have been cleared?
- A clear definition of incompatible and compatible vegetation on and in the immediate surroundings of the development must be defined and maintained as such. No tree or shrubs shall be allowed to grow to a height in excess of the horizontal distance of that tree or shrub from the nearest newly developed structure or to grow in such a manner as to endanger the development or its operation.

- Who will take long-term ownership and hence responsibility for the rehabilitation and its subsequent monitoring and management? Continued monitoring of vegetation establishment and composition, as well as erosion detection will have to be coupled with continued follow-up maintenance of rehabilitation and erosion control from commencement of activity up to the decommissioning phase.
- The ultimate objective for rehabilitation should focus on the stabilisation of soil erosion, retaining agricultural potential of transformed areas and /or the establishment of a dense and protective plant cover and the maintenance of habitats to enable vegetation to persist and flourish on rehabilitated areas indefinitely, ultimately relying only on environmental resources.

15.1 Map and Create Management Areas

The entire project area must be mapped and divided into management areas indicating:

- Current land cover
- Roads and residential
- Areas with IAPs, subdivided further in sparse or dense infestations where applicable
- Transformed areas
- Untransformed indigenous vegetation

For every one of the management areas, the project proponent, in consultation with the land users, will have to decide what intervention will be necessary, desirable, and feasible to enable the development of the project and long-term sustainable maintenance of infrastructure. Thus, for every management area there must be an operational outline on:

- what will happen there
- what needs to be mitigated – including storm water- and erosion management
- which management units need priority intervention / mitigation
- how will this mitigation / intervention be done (method statements) including schedule of work
- realistic and desirable end states including list of species that should be established to initiate rehabilitation after initial revegetation
- approximate timeframes
- monitoring protocol to evaluate success or failures of interventions
- establish permanently marked transects and monitor with fixed-point photography who will be responsible for doing what how will different actions be integrated to achieve and maintain or improve the desirable end state of the environment of that management unit.

Special attention will have to be given to drainage zones, as these not only have very active morphodynamics, but are also distributers of seeds – both indigenous and of IAPs. Thus, clearing a downstream invasion of aliens to enable maintenance of the development will be futile if the upstream IAPs are not cleared or at least aggressively controlled.

15.2 Setting Realistic Rehabilitation Goals

Rehabilitation efforts typically aim at improving ecosystem function that consists of a series of processes, which can in the end be evaluated against a desired outcome or reference state of the vegetation and environment.

Attainable goals of rehabilitation on the project area should be possible and viable for at least the following:

- Stabilisation of soils
- Stabilisation of riparian areas
- Storm water reduction through management and wetland integrity
- Clearing of IAPs

    - The degree to which IAPs can be cleared from the project area needs to be determined according to desirability, available project funding, personnel and project requirements
- Restoring and/or rehabilitating vegetative cover on non-transformed areas to obtain an acceptable vegetation cover that can be maintained or persists on its own indefinitely

15.3 Remove or Ameliorate the Cause of Degradation

This will include:

- Physical rehabilitation of topsoil where it has been removed.
- Topsoil on areas that have not been cultivated are considered as the upper 20 - 30 cm only. These contain the most important nutrients, micro flora and – fauna essential for nutrient cycling processes. Topsoils are also important source of seeds.
- Subsoils and overburden substrata lack the above elements and will first have to be used for physical rehabilitation of landscapes as and where necessary, and then overlain with topsoils.
- Stabilisation of topsoils and prevention of erosion – refer to the Erosion management plan.
- Removal of all invasive vegetation – refer to the Alien Invasive Management Plan.

Where it is desirable to use brush or logs of the cleared vegetation for soil stabilisation, such material must be free of regenerative material – e.g., seeds or root suckers.

15.4 Initial Revegetation

Immediately after clearing of vegetation, the soil surface must be inspected for signs of erosion and stabilised as soon as possible. After completion of construction, such erosion stabilisation should preferably be with a cover of vegetation. A dense initial grass or other perennial cover will be desirable. The appropriate seed mix should be determined in consultation with an ecologist familiar with the area. The aim of the first vegetation cover is to form a protective, relatively dense indigenous layer to slow runoff, increase moisture infiltration into the soil, and gradually change the soil nutrient status in order for it to be more favourable for other desirable indigenous vegetation to become established.

15.5 Natural seed banks and improvement of plant structural and compositional diversity

It is expected that soil seed banks of indigenous vegetation will be present to initiate initial vegetation cover, but may not be sufficient to establish an acceptable cover of desirable species. After deciding which indigenous species should be re-introduced, seed should be ideally collected from site or an environmentally-matched site nearby.

Seed collection may be done throughout the year as seed ripens, but can also be restricted to summer, when a large amount of the perennial seed should have ripened. Seeds should be stored in paper or canvas bags dusted with insecticide, and sown at the onset of the rainy season.

Alternatively, slower-growing perennials may be raised from seed or cuttings in a nursery and then transplanted once established. It will be beneficial to investigate if community members would be able to create and maintain such a nursery, or if there are nurseries in the area, that raise indigenous flora from the area.

The final vegetation cover should resemble the original (non-encroached) vegetation composition and structure as far as practicable possible or permissible within each management unit.

For drainage areas:

- First restore drainage line morphology following the guidelines of the Erosion Management Plan – without that ecological recovery cannot be initiated.
- Determine if natural seed sources may be present further upstream.
- If such upstream seed sources are still present, rehabilitation of riparian vegetation after soil erosion management will most likely occur naturally, provided that follow-up monitoring of the establishment of vegetation is carried out, and all invasive species eradicated as they emerge. This can only be achieved with a long-term commitment (> 5 years minimum).
- Should no upstream seed resources be available, suitable species (as determined in consultation with an ecologist) should be sown or planted.

15.6 Monitoring and follow-up action

Throughout the lifecycle of the development, regular monitoring and adaptive management must be in place to detect any new degradation of ecosystems affected by the development, and remedy these as soon as detected.

During the construction phase, the and contractor will be responsible for initiating and maintaining a suitable monitoring system. Once the development is operational, the project proponent will have to identify a suitable entity that will be able to take over and maintain the monitoring cycle and initiate adaptive management as soon as it is required. Monitoring personnel must be adequately trained.

The following are the minimum criteria that should be monitored:

- Composition and density of replanted vegetation, distinguishing between species introduced for initial revegetation only and species that are part of the pre-determined desirable end state
- Associated nature and stability of surface soils
  - It is recommended that permanent transects are marked and surveyed annually according to the LFA technique (Tongway and Hindley 2004), adapted to integrate both surface soil characteristics and the vegetation to be monitored
- Re-emergence of IAPs
  - If noted, remedial action must be taken immediately according to Working for Water specifications
- Nature and dynamics of riparian zones
  - Stability of riparian vegetation
  - Any form of bank erosion, slumping or undercutting
  - Stability of channel form and width of streams – if this increases, it shows that vegetation on plains and/or riparian areas and upper drainage lines are not yet in a stable enough state to be fully functional in reducing excess runoff and the ecosystem overall is losing valuable resources

15.7 Timeframes and Duration

- Rehabilitation will occur during construction, as areas for the re-application of topsoil and revegetation become available or where revegetation can be initiated after clearing of invasives or to stabilise erosion.
- The initial revegetation period post construction is estimated to be over a period of 6 (minimum) to 12 months (maximum), or a time period specified by the Horticultural Landscape Contractor, particularly if planting of trees and shrubs occurs.
- The rehabilitation phase (including post seeding maintenance) should be at least 12 months (depending on time of seeding and rainfall) to ensure establishment of an acceptable plant cover is achieved (excluding invasive plant species or weeds).

- If the plants have not established and the acceptable plant cover is not achieved within the specified maintenance period, maintenance of these areas shall continue until an acceptable plant cover is achieved (excluding alien plant species or weeds).
- Additional seeding or planting may be necessary to achieve acceptable plant cover. Hydroseeding may have to be considered as an option in this case.
- Any plants that die, during the maintenance period, shall be replaced by the Horticultural Landscape Contractor (at the Horticultural Landscape Contractor's cost if it was due to insufficient maintenance).
- Succession of natural plant species should be encouraged
- Monitoring of rehabilitation success and follow-up adaptive management, together with clearing of emerging invasives shall be carried on until the decommissioning phase has been completed.

16 OPEN SPACE MANAGEMENT PLAN

The objective of open space management is to restore, enhance and rehabilitate open spaces, improve climate change adaptations through the minimisation of biodiversity loss, and mitigate against environmental degradation. Management actions consider open spaces and natural areas as well as community perceptions of these.

In the context of the proposed grid connections and substations the primary purpose of the open plan management plan is therefore to:

- Minimise visual impact on the character of the area; and
- Maintain biodiversity within the area to ensure that no long-term negative impacts occur on the local environment.

The proposed grid connections and associated infrastructure has the potential to impact negatively on the character of the area, as identified in the Visual Impact Assessment conducted during the EIA phase. The following actions must be implemented to minimise this visual impact:

- Grid connection route to avoid visually sensitive peaks, major ridgelines, scarp edges and slopes steeper than 1:5 gradient.
- Substation to be sited in unobtrusive low-lying areas, away from roads and habitations, and screened by berms and/or tree-planting where feasible.
- Operations and maintenance buildings and parking areas to be located in an unobtrusive area and consolidated to avoid sprawl of buildings in the open landscape.
- Access roads to be in sympathy with the contours, avoid steep 1:5 slopes and drainage courses, and kept as narrow as possible.
- Access and haul roads to use existing farm tracks as far as possible.
- Construction camp, stockpiles and lay-down area to be located out of sight of district roads, possibly in the vicinity of the proposed substation and O&M buildings.
- Disturbed areas rather than pristine or intact land to preferably be used for the construction camp. Construction camp and laydown areas to be limited in area to only that which is essential.
- Measures to control wastes and litter to be included in the contract specification documents.
- Provision to be made for rehabilitation / re-vegetation of areas damaged by construction activities.

In order to maintain biodiversity, the Alien Invasive, Plant Rescue and Protection and Re-vegetation and Habitat Management Plans must be adhered to.

In addition, the following actions should be implemented by the Contractor and Project Company:

- Promote environmental awareness in all employees and sub-contractors and create an understanding of the environmental sensitivities of the project site;
- No waste, including organic matter may be disposed of anywhere on site, except in provided bins placed at convenient locations, especially during the construction period. Disciplinary actions should be taken against littering;
- Open spaces are to be kept free of alien plants and weeds;
- Indigenous plants may not be collected or removed from the site;
- Access to the facility should be strictly controlled;
- All visitors and contractors should be required to sign-in; and
- Signage at the entrance should indicate that disturbance to fauna and flora is strictly prohibited.

The following activities should not be permitted by anyone except the landowner or his representatives:

- No fires within the site.
- No hunting, collecting or disturbance of fauna and flora, except where required for the safe operation of the facility and only by the Environmental Officer on duty and with the appropriate permits and landowner permission.
- No driving off of demarcated roads.
- No interfering with livestock.

16.1 Grazing Management

The development of the wind energy facility will not prevent the site from being used for its current land-use of extensive livestock production. Extensive livestock grazing is compatible with biodiversity maintenance provided that it is implemented according to the basic principles of sustainable grazing management. While the majority of these are beyond the scope of the current plan, the following basic principles should be adhered to:

- A grazing management plan for the site should be developed in cooperation with Agricultural Extension services.
- The stocking rate applied should be within the recommended limits as identified by the Department of Agriculture.
- Livestock should be rotated through the different paddocks at the site in a manner which allows for the growth and recovery of the vegetation between grazing events.
- Precautions should be taken to ensure that the development of the site does not increase the risk of stock theft within the facility. These include access control as previously described, as well as security patrols.

17 TRAFFIC MANAGEMENT PLAN

The objective of the traffic management plan is the prevention of incidents from the use of vehicles and disturbance of local traffic on public roads during the construction, operation and decommissioning phases of the proposed projects. Traffic volumes are most likely to increase during the construction phase. However, due to the remote location of the site, and the low volume of traffic on public roads in the area the impact is expected to be low.

The San Kraal WEF must be accessible to passenger cars, buses, trucks and abnormal multi-vehicle combinations which will be delivering WT components. Access to the site needs to be safe and practical to minimise the risk of pedestrian and vehicle accidents through:

- The provision of adequate traffic control; and
- Clear visibility by ensuring sufficient stopping sight distances and sufficient markings and warnings signs.

The traffic management plan to be implemented during construction and decommissioning should consist of the following recommended mitigation measures:

- The arrival and departure of construction vehicles should be staggered during off- peak periods to have a distributed effect over low volume traffic periods.
- All vehicles with abnormal loads should have exemption permits as required by the National Road Traffic Act 93 of 1996.
- The Contractor and Site Safety Officer / ESO, during construction and decommissioning should ensure correct signage and safety precautions are in place for vehicles and pedestrians on-site and at the site access. These may include warning signs, construction vehicle signage and flagmen.
- Unpaved roads must be watered to lesson dust generation and routine maintenance on road surface to maintain condition.
- Vehicles transporting materials that can be blown away and cause dust must be securely covered and adhere to speed limits.
- Community participation/stakeholder involvement at every stage of the project is recommended to allow the community to be informed before the start of site activities.
- A comprehensive assessment of the entire route is recommended prior to construction.
- Prohibit WEF equipment and materials transportation at night, during the school December holiday period, on public holidays, during festivals or other special events.

Actions to be implemented by the Contractor and the Developer:

- Limit use of private cars by arranging mini bus transport service for workers;
- Monitor for overloading of vehicles;
- Use only well trained, suitably qualified and experienced drivers in possession of an appropriate and valid driver's license;
- All vehicles must be roadworthy and serviced regularly;
- Clear and visible signage must be placed on and around site, clearly demarcating safe entry and exit points;
- Require all drivers to abide by standard road and safety procedures on site;
- When travelling on public roads all speed limits and rules of the road must be adhered to; and
- Limit dust generation by applying dust suppressants and postponing dust generating activities during period of strong winds and enforcing a strict speed limit of 40 km/h on unpaved roads.

Monitoring actions to be conducted by the ECO / ESO:

- Maintain incidents / complaints register for community complaints; and
- Monitor dust generation and implementation of management actions detailed above.

18 TRANSPORTATION MANAGEMENT PLAN

The Transportation Management Plan aims to ensure the safe transportation of all components required for the construction of the proposed project to the construction site. This includes the turbines, substation transformers, electrical cables and pylon structures.

As part of the Traffic Management Study that was undertaken for the development, the following regarding transportation management must be considered and implemented:

- Transport requirements for the WEF project will require the use of abnormal load vehicles as stipulated in the TRH 11, especially in the construction phase of the project for the delivery of construction materials and turbine components. Very little to no special transport will be required during the remainder of the development phases as standard transport will be used.
- All WT components are considered to be abnormal loads, either through length, weight or height, usually comprising of 3 tower sections, 1 hub, 1 nacelle and 3 blades. These

require different truck / trailer combinations and configurations to be transported. These issues will be investigated at a later stage when the transporting contractor and the plant hire companies apply for the necessary permits from the permit issuing authorities. The heaviest component of a wind turbine is the nacelle (approximately 67 to 85 tons depending on manufacturer and design of the unit). Combined with road-based transport, it has a total vehicle mass of approximately 130 000 kg (for the 85 ton unit). Thus, route clearances and permits will be required for transporting the nacelle by road based transport.

- Blades are the longest component, ranging between 45 – 75 m, and need to be transported on a specially imported extendible blade transport trailer or in a rigid container with rear steerable dollies. The blades can be transported individually, in pairs or in three's although different manufacturers have different methods of packaging and transporting the blades. Where required, existing public roads may need to be upgraded along the proposed equipment transport route to allow for the transportation and delivery of wind turbine components and other associated infrastructure components. The national roads on the potential national access routes are generally of high standard and many of the structures have been assessed for load bearing capacity and height clearance in the past. Turbine supplier/s or the contractor selected for implementation would be responsible for the transportation of wind turbine components to site.

18.1 Permit requirements

In transportation of loads the following guidelines are available. According to the TRH 11, the expected load dimensions are classified as abnormal load, therefore an exemption permit for each province that the load has to transit is required.

Provision for the type of abnormal loads in this development is made in the National Road Transport Act (NRTA), and specifically in Section 81 of the NRTA, which reads as follows:

"Vehicle and load may be exempted from provisions of Act

An MEC may, subject to such conditions an upon payment of such fees or charges as he or she may determine, authorise in writing, either generally or specifically, the operation on a public road of a vehicle which does not comply with the provisions of this Act or the conveyance on a public road of passengers or any load otherwise that in accordance with the provisions of this Act."

When the movement of an abnormal load is considered to be in the economic and/or social interest of the country, an exemption permit may be issued to allow a vehicle(s) transporting such an abnormal load to operate on a public road for a limited period. The fundamental principles guiding this process are:

- An exemption permit for an abnormal load will only be considered for an indivisible load, abnormal in dimension and/or mass, where there is no possibility of transporting the load in a legal manner.
- The risks to other users must be reduced to a level equivalent to what it would be without the presence of the abnormal vehicle on the road; and
- The conditions imposed must take the economic and/or social interest of the country and public at large into account.

18.2 Types of Abnormalities

The WEF is anticipated to carry loads that are considered to be indivisible, can be abnormal either dimensionally or abnormal in mass or abnormal both dimensionally and in mass.

The following is the Legally Permissible Maximum Dimensions / Mass:

Length- Truck & Semi-trailer (Tri-Axle) Overall length of combination (Including load projections) -18.50m. Superlink (6m + 12m trailers) Overall length of combination (No load projections) –22.00m.

Width- 2.60 m.

Height- 4.30 m measured from the ground. Height of conventional trailer is 1.60m from ground to trailer deck, therefore permissible height of load is 2.70m.

Weight- 13.50m Tri-Axle 28 Ton / 15.00m Tri-Axle 30 Ton. Superlink 34 Ton gross (6.00m –10 / 12 Ton & 12m –24 / 22 Ton)

The WEF components are classified as an Abnormal Load and will necessitate the application to the Department of Transport and Public Works for a permit authorising the conveyance of said load.

With the required permits in place, the following escort vehicles (whether it is the clients own escort vehicles or provincial traffic officer) will be necessary to escort the transportation of abnormal loads. The anticipated escort vehicles are presented in Table 18.1.

It must be noted Loads with a height of 4.70m measured from the ground require –1 x Own Escort vehicle. For loads of 5.50m + high Telkom & Eskom Clearances are required for the lifting of overhead lines. Upon final selection of WT models to be used, the exact amount of escort vehicles can be determined.

Table 18.1: Escort Vehicles

	Details	**Escort Vehicles**
Tower	Length: 150 m	3 Tower sections/WT 2 x Provincial Traffic Escorts (subject to width of load)
Rotor	Blade Length: 75 m Hub	3 Blades/WT Connected to 1 Hub/WT 2 x Provincial Traffic Escorts (subject to width of load)

18.3 SANRAL Consultation

Consultation took place with SANRAL on 09 January 2018. It was established that:

- SANRAL's Western Region (head office in Cape Town, Western Cape) is responsible for the section of the N9 where the access points are proposed (accesses are located in the Northern Cape). The project manager of this section of the N9 is Mr Deriek Wilson - 021 957 4600.
- SANRAL's Southern Region (head office in Port Elizabeth, Eastern Cape) will be responsible for the remainder of the N9 route to/from the site and Port. The project manager for the N9 between Graaff-Reinet and Carlton Heights is Mr Danford Adams - 041 398 3200.
- The TIA, a plan indicating existing intersections and layouts as well as planned intersections and proposed layouts produced by the Developer must be submitted to SANRAL's statutory control section for approval before construction. SANRAL may then request additional information as required
    - Consultation will take place during the public participation process of this final EMPr and development layout.

19 STORMWATER MANAGEMENT PLAN

The objective of the storm water management plan (SWMP) is to prevent increased soil erosion, to contain any contaminated run-off and to avoid water logging and pollution. The

Erosion Management Plan (see below) must therefore be seen in conjunction with the SWMP. Actions are listed that will ensure that storm water is channelled in a controlled manner from roads and substations towards natural drainage lines, without impeded natural surface flows.

- Develop and implement a site-specific storm water management plan during the detailed design phase of the projects and prior to construction;
- In the detailed design phase of the project minimise any water crossings and utilise existing roads wherever possible;
- Enforce 32 m construction buffers of all rivers, streams and waterbodies;
- Should new roads be required to cross any banks or channels these must be secured with erosion protection (i.e., gabions etc.);
- Monitor for erosion during the clearing of vegetation;
- Avoid hard-engineered surfaces (i.e., construct gravel roads and not asphalt roads wherever possible);
- Roads in steep areas must be equipped with side drainages and culverts that channel the run-off to natural drainage lines without gaining velocity and causing erosion;
- Construction camps and temporary ablution facilities must be located beyond the 1:100 year flood line;
- Stockpiles must be located on flat areas and protected from erosion;
- The substation site design must include side water outlets and an adequate slope to allow storm water run-off from the paved areas; and
- Prevent surface run-off from areas of potential contamination.

20 EROSION MANAGEMENT PLAN

The purpose of the erosion management plan is to implement avoidance and mitigation measures to reduce the erosion potential and the likely impact of erosion associated with the construction and operational phases of the proposed facility. As part of the management plan, measures to protect hydrological features from erosion damage are included.

20.1 Scope and Limitations

This plan is intended at introducing measures aimed at reducing the negative impacts of erosion on biodiversity as well as reducing the vulnerability of the site to erosion problems during the construction and operational phases of the development. The focus is on managing runoff and reducing the construction phase impact on ecologically sensitive areas. The plan does not cover engineering-side issues which are of relevance to soil management and erosion. Therefore, issues such as the potential presence of heaving clays, compressible soils, perched water tables, dispersive soils and corrosive groundwater at the site are beyond the general scope of this study and are not directly dealt with. These issues would need to be addressed and their relevance assessed during detailed geotechnical investigation of the site.

20.2 Background

20.2.1 Types of Erosion

Erosion comes in several forms, some of which are not immediately obvious. The major types of erosion are briefly described below:

Raindrop impact

This is the erosion that occurs due to the "bomb blast" effect of raindrop impact. Soil particles can be blasted more than a meter into the air. Apart from loosening soil particles,

the effect can also break soil aggregates apart and form a clay seal on the surface which resists infiltration and results in increased levels of runoff. This effect is most important when large areas of exposed soils are present. If the site is cleared, then this effect will play an important role as it results in the soil surface becoming sealed which reduces infiltration and increases runoff, leading to erosion.

Sheet Erosion

This is the removal of a shallow and uniform layer of soil from the surface. It is caused initially by raindrop splash and then by runoff. Sheet erosion is often difficult to see as no perceptible channels are formed. Accumulated sediment at the bottom of the slope is often the only indicator. This is likely to be an important erosion type at the site given the gently sloping nature of the site and the susceptible soils.

Rill Erosion

This is the removal of soil from the surface whereby small channels or rills up to 300 mm are formed. It is caused by runoff concentrating into depressions, wheel tracks etc.

Gully Erosion

This is the removal of soil from the surface and sub-surface caused by concentrated runoff eroding channels greater than 300 mm deep. Gully erosion often begins as rill erosion.

Wind Erosion

Wind erosion results from soil particles being picked up, bounced or moved by the wind. Wind erosion is primarily a problem in arid areas and may affect sands soils as well as fine-textured soils. Vegetation cover is usually an effective barrier to wind erosion, but large soils losses or degradation can occur in disturbed areas or on croplands.

20.2.2Promoting Factors

Rainfall characteristics

High-intensity, short-duration storm events have much greater erosion potential than low intensity, longer duration storm events with the same runoff volume. Intense storms produce larger raindrops, and are more likely to break up the soil and dislodge particles.

Soil erodibility

Soil erodibility is determined by the soils ability to resist detachment and transport due to rainfall, runoff and infiltration capacity. Well-structured soils with a high clay content are generally least erodible. Some clays are dispersible meaning that they break down when wet and become highly erodible. Silts and fine sands are highly erodible.

Length and Steepness of Slope

Steeper slopes cause runoff velocities to increase, resulting in increased erosion. As the slope length increases the opportunity for runoff to concentrate and achieve an erosive velocity increases.

Soil Surface Cover

Soil surface cover such as vegetation and mulch protect the soil surface from raindrop impact, reduce flow velocity, disperse flow, and promote infiltration and the deposition of sediment. This is a basic principle underlying many erosion control approaches which aim to modify the surface characteristics in order to reduce the flow velocity and reduce the

potential for erosion. In this regard it is important to note that many of the practices which are used to enhance rehabilitation potential are also useful in reducing erosion potential.

20.2.3Erosion and Sediment Control Principles

The goals of erosion and sediment control during and after construction at the site should be to:

- Protect the land surface from erosion;
- Intercept and safely direct run-on water from undisturbed upslope areas through the site without allowing it to cause erosion within the site or become contaminated with sediment.
- Progressively revegetate or stabilise disturbed areas.
- Prevent damage to hydrological features such as drainage lines or wetlands, either within or adjacent to the site.

These goals can be achieved by applying the following principles:

1. Integrate project design with site constraints.
2. Plan and integrate erosion and sediment control with construction activities.
3. Minimise the extent and duration of disturbance.
4. Control stormwater flows onto, through and from the site in stable drainage structures.
5. Use erosion controls to prevent on-site damage.
6. Use sediment controls to prevent off-site damage.
7. Control erosion and sediment at the source.
8. Stabilise disturbed areas promptly.
9. Inspect and maintain control measures.

20.2.4On-Site Erosion Management

Exposed and unprotected soils are the main cause of erosion in most situations. Therefore, the erosion management plan and the revegetation and rehabilitation plan should be closely linked to one another and should not operate independently, but should rather be seen as complementary activities within the broader environmental management of the site and should therefore be managed together.

General factors to consider regarding erosion risk at the site includes the following:

- Soil loss will be greater during wet periods than dry periods. Intense rainfall events outside of the wet season, such as occasional unseasonal showers can also however cause significant soil loss. Therefore, precautions to prevent erosion should be present throughout the year.
- Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilization. Therefore, the gap between construction activities and rehabilitation should be minimized. Allied to this the fact that topsoil does not store well and should preferably be used within a month or at most within 3 months to aid in the revegetation and rehabilitation of disturbed areas.
- Phased construction and progressive rehabilitation are important elements of the erosion control strategy.
- The extent of disturbance will influence the risk and consequences of erosion. Therefore, large areas should not be cleared at a time, especially in areas such as slopes where the risk of erosion is higher.

20.3 Concentration of flows into downstream areas

Road crossings over drainage lines, streams and wetlands can impact downstream wetland ecosystems. Crossings that result in narrowing of the downstream system can result in

concentration of flows and channelisation downstream. This may result in a loss of wetland function, and result in the drying out and shrinkage of the wetland area. Erosion and increased vulnerability to invasion of drier banks by alien vegetation may occur.

- Culverts should be adequately spaced such that they do not result in shrinkage of downstream wetlands. Where roads cross minor drainage channels, a single culvert may be adequate, aligned with the downstream drainage line. Where more substantial wetland systems are intercepted by a road, sufficient culverts should be provided such that downstream shrinkage of wetland width does not occur. Moreover, culverts should be aligned, as far impossible, with existing, natural channels.
- All crossings of drainage systems should ensure that both surface and shallow subsurface flows can be accommodated where appropriate and that unnatural channelisation does not occur downstream.

20.4 Runoff Concentration

The increase in hardened surfaces associated with roads, and other infrastructure will lead to a significant increase in volume and velocity of flow generated from these areas during large rainfall events.

Runoff from road surfaces is usually channelled off of the road surface towards the downslope side of the road. On steep slopes, the volumes and velocity of runoff generated may result in erosion of the surrounding areas. Therefore, specific measures to curb the speed of runoff water is usually required in such areas, such as rock beds or even gabions. In addition, these areas should be monitored for at least a year after construction to ensure that erosion is not being initiated in the receiving areas. Once erosion on steep slopes has been initiated, it can be very difficult to arrest.

20.4.1 Diversion of Flows

Diversion of flows from natural drainage channels may occur when roads interrupt natural drainage lines, and water is forced to run in channels along the manipulated road edge to formalized crossing points. Even slight diversion from the natural drainage line can result in excessive downstream erosion, as the new channel cuts across the slope to reach the valley bottom. Should the access road to the site traverse any major drainage lines, the following principles should apply:

- Adequate culverts should be provided along the length of all roads to prevent diversion of flow from natural drainage lines.
- Culverts should be carefully located, such that outlet areas do in fact align with drainage lines.
- The downstream velocity of runoff should be managed, such that it does not result in downstream erosion – on steep slopes, where roads have been constructed on cut areas, allowance should be made for culverts to daylight sufficiently far down the slope that their velocities are managed and erosion does not occur.
- Where necessary, anti-erosion structures should be installed downstream of road drains – these may comprise appropriate planting, simple riprap or more formal gabion or other structures.
- Roads and their drainage system should be subject to regular monitoring and inspection, particularly during the wet season, so that areas where head cut erosion is observed can be addressed at an early stage.

20.5 Monitoring Requirements

20.5.1 Construction Phase

The following monitoring actions should be implemented during the construction phase of the development:

Monitoring Action	Indicator	Timeframe
Identify all river and drainage line crossings affected by the development	Map of sites of potential concern	Preconstruction
Monitor cleared areas for erosion problems	Record of monitoring site, problems encountered and remedial actions implemented	Monthly during the rainy season and following significant rainfall events otherwise
Monitor vegetation clearing activities near sensitive areas such as wetlands or drainage lines	Activity log of monitoring actions and any mitigation and avoidance measures implemented	Monthly during the rainy season and following significant rainfall events otherwise
Monitor revegetated and stabilised areas	Record of monitoring site, problems encountered and remedial actions implemented	Monthly during the rainy season and following significant rainfall events otherwise

20.5.2 Operational Phase

The following monitoring actions should be implemented during the operational phase of the development:

Monitoring Action	Indicator	Timeframe
Monitor for the development of new erosion problems across the site, with a focus on areas where water has been diverted or collected from upslope onto downslope areas	Map of erosion problem areas	Quarterly
Document erosion control measures implemented	Records of control measures and their success rate.	Quarterly
Document the extent of erosion at the site and the remedial actions implemented	Decline in erosion and vulnerable bare areas over time	Biannually

21 FIRE MANAGEMENT PLAN

The National Veld and Forest Fires Act (Act 101 of 1998) states that it is the landowner's responsibility to ensure that the appropriate equipment as well as trained personnel are available to combat fires.

Although fires are not a regular occurrence at the site, fires may occasionally occur under the right circumstances. Ignition risk sources in the area include the following:

- Lightning strikes;
- The railway system, which lie a short distance West of the site;
- Personnel within the facility; and

- Infrastructure such as transmission lines.

21.1.1 Firebreaks

Extensive firebreaks are not recommended as a fire risk management strategy at the site. The site is very large compared to the extent of the infrastructure and the maintenance of firebreaks would impose a large management burden on the operation of the facility. In addition, the risk of fires is not distributed equally across the site and within many of the lowlands of the site, there is not sufficient biomass to carry fires and the risk of fires within these areas is very low. Rather targeted risk management should be implemented around vulnerable or sensitive elements of the facility such as substations or other high risk components. Within such areas, the extent over which management action needs to be applied is relatively limited and it is recommended that firebreaks are created by mowing and that burning to create firebreaks is not used as this in itself poses a risk of runaway fires. Where such firebreaks need to be built such as around substations, a strip of vegetation 5 - 10 m wide can be cleared manually and maintained relatively free of vegetation through manual clearing on an annual basis. However, if alien species colonise these areas, more regular clearing should be implemented.

22 AVIFAUNA MANAGEMENT PLAN

The avifauna monitoring and management plan must be implemented during the construction and operation of the facility. This plan must be drafted by a suitably qualified avifauna specialist.

Activity	Mitigation and Management Measure	Responsible Person	Applicable Development Phase	Include as Condition of Authorisation	Monitoring requirements
Displacement of priority species due to disturbance during construction operations	All contractors are to adhere to the EMP and should apply good environmental practice during construction. ESO / ECO to oversee activities and ensure that the site-specific EMP is implemented and enforced via regular inspections. The ESO and ECO must be trained to identify the potential priority species as well as the signs that indicate possible breeding by these species. The ECO must then, during audits/site visits, make a concerted effort to look out for such breeding activities of Red Data species, and such efforts may include the training of construction staff to identify Red Data species, followed by regular questioning of staff as to the regular whereabouts on site of these species. If any of the Red Data species are confirmed to be breeding (e.g., if a nest site is found), construction activities within 500 m of the breeding site must cease, and an avifaunal specialist is to be contacted immediately for further assessment of the situation and instruction on how to proceed. Prior to construction, an avifaunal specialist should conduct a site walkthrough, covering the final road and power line routes as well as the final turbine positions, to identify any nests/breeding/roosting activity of priority species. The results of which may inform the final	ESO / ECO and Avifaunal specialist	Construction	Yes	If a priority species nest is discovered during the construction phase, the ESO / ECO must conduct weekly inspections of the nest to monitor the breeding effort, in consultation with the avifaunal specialist.

Activity	Mitigation and Management Measure	Responsible Person	Applicable Development Phase	Include as Condition of Authorisation	Monitoring requirements
	construction schedule in close proximity to that specific area, including abbreviating construction time, scheduling activities around avian breeding and/or movement schedules, and lowering levels of associated noise. During the construction phase, the avifaunal specialist must conduct surveys/exploration of the WEF site (particularly focussing on potential Verreaux's Eagle roost sites as well as suitable nesting habitat). This should be done during and after, the breeding season (i.e., approximately in July and again in September). The aim will be to locate any new nest sites, so that these may be monitored during the construction and operational phase.				
Displacement of priority species due to habitat transformation during construction phase	All contractors are to adhere to the EMP and should apply good environmental practice during construction. EMP should include the following: Existing roads and farm tracks should be used where possible; The minimum footprint areas of infrastructure should be used wherever possible, including road widths and lengths; No off-road driving; ECO to hold regular inspections ensure that the EMP is implemented and enforced; Any clearing of stands of alien trees on site should be approved first by the avifaunal specialist. Following construction, rehabilitation of all areas disturbed (e.g., temporary access tracks and laydown areas) must be undertaken and to this end a habitat restoration plan is to be developed by a rehabilitation specialist and included within the EMPr.	ESO / ECO Avifaunal specialist Rehabilitation specialist	Construction	Yes	ESO / ECO to oversee activities and ensure that the site-specific EMP is implemented and enforced via regular inspections

Activity	Mitigation and Management Measure	Responsible Person	Applicable Development Phase	Include as Condition of Authorisation	Monitoring requirements
Priority species mortality due to collisions with the turbines	Mortality thresholds should be determined by the avifaunal specialist in consultation with BirdLife SA, for priority species recorded during the pre-construction monitoring, prior to the wind farm becoming operational. Once the turbines have been constructed, operational monitoring should be implemented under the guidance of an avifaunal specialist to assess collision rates, in accordance with the latest version of the best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa. If collision rates indicate mortality exceeding threshold levels of priority species, curtailment must be implemented during high risk periods. These periods, and the number of turbines to be curtailed, will be determined by the avifaunal specialist in consultation with the wind farm management. Regular inspections must be conducted by the ECO to ensure that rock piles are removed from site or covered with topsoil to prevent them from becoming habitat for Rock Hyrax (Dassie) *Procavia capensis*.	Wind farm management, ESO / ECO, and avifaunal specialist (in consultation with BirdLife SA)	Operational	Yes	Once the turbines have been constructed, operational monitoring should be implemented under the guidance of an avifaunal specialist to assess collision rates, in accordance with the latest version of the best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa.
Priority species mortality due to collision with the on-site powerlines	An avifaunal specialist must conduct a site walk through of final pylon positions prior to construction to determine if, and where, bird flight diverters (BFDs) are required. Bird flight diverters must be installed as per the instructions of the specialist following the site walkthrough, which may include the need for modified BFDs fitted with solar powered LED lights on certain spans. The operational monitoring programme must include quarterly monitoring of all overhead power lines for collision mortalities, with a view to mark additional spans with BFDs if necessary.	Avifaunal specialist	Operational	Yes	The operational monitoring programme must also include quarterly monitoring of the overhead power lines for collision mortalities.

Activity	Mitigation and Management Measure	Responsible Person	Applicable Development Phase	Include as Condition of Authorisation	Monitoring requirements
Priority species mortality due to electrocution on the on-site powerlines	An avifaunal specialist must certify that the pole structures to be used on the internal MV network is bird-friendly.	Avifaunal specialist	Design	Yes	The operational monitoring programme must also include quarterly monitoring of the overhead power lines for electrocution mortalities.
Displacement of priority species due to disturbance during decommissioning operations	All contractors are to adhere to the EMP and should apply good environmental practice during decommissioning. Following decommissioning, rehabilitation of all areas disturbed must be undertaken and to this end a habitat restoration plan is to be developed by a rehabilitation specialist and included within the Environmental Management Plan (EMP).	Site management Rehabilitation specialist	Decommissioning	Yes	None

23 BAT MANAGEMENT PLAN

Currently the most effective method of mitigation, after correct turbine placement, is alteration of blade speeds and cut-in speeds under environmental conditions favourable to bats.

A basic "6 levels of mitigation" (by blade manipulation or curtailment), from light to aggressive mitigation is structured as follows:

1. No curtailment (free-wheeling is unhindered below manufacturer's cut in speed so all momentum is retained, thus normal operation).
2. Partial feathering (45-degree angle) of blades below manufacturer's cut-in speed in order to allow the free-wheeling blades half the speed it would have had without feathering (some momentum is retained below the cut in speed).
3. Ninety degree feathering of blades below manufacturer's cut-in speed so it is exactly parallel to the wind direction as to minimize free-wheeling blade rotation as much as possible without locking the blades.
4. Ninety degree feathering of blades below manufacturer's cut-in speed, with partial feathering (45-degree angle) between the manufacturers' cut-in speed and mitigation cut-in conditions.
5. Ninety degree feathering of blades below mitigation cut in conditions.
6. Ninety degree feathering throughout the entire night.

It is recommended that curtailment be applied from the start of operation at Level 3 on all turbines for every night of the year from dusk until dawn.

Should robust and scientifically defendable data gathered during the operational study phase reveal higher bat mortalities than currently anticipated, the mitigations in Table 23.1 should be applied to the turbines identified as causing the highest impacts. Such curtailment specified in Table 23.1 will have to be at a maximum of Level 5. The turbine layout avoids all High and Moderate bat sensitivities and their buffers.

The Table 23.1 below is based on the passive data collected. They infer mitigation be applied (only when needed as described above) during the peak activity periods and times, and when the advised wind speed and temperature ranges are prevailing simultaneously, considering conditions in which 80% of bat activity occurred (normalised data). Bat activity at 50 m height were used, with wind speed data at 50 m and temperature data at 37.5 m.

Table 23.1: The periods and weather conditions for implementation of mitigation.

	Terms of mitigation implementation
Peak activity (times to implement curtailment/ mitigation)	1 October – 15 November; sunset – 20:30
Environmental conditions in which to implement curtailment/ mitigation	Wind speed below 4.5m/s and simultaneously Temperature above 11°C
Peak activity (times to implement curtailment/ mitigation)	15 February – 31 March; sunset – 04:00
Environmental conditions in which to implement curtailment/ mitigation	Wind speed below 5m/s and simultaneously Temperature above 14°C

24 NOISE MANAGEMENT PLAN

Environmental Noise Measurement can be divided into two distinct categories, namely:

- Passive measuring – the registering of any complaints (reasonable and valid) regarding noise; and
- Active measuring – the measurement of noise levels at identified locations.

No active environmental noise monitoring is recommended due to the low significance for a noise impact to develop. However, should a reasonable and valid complaint about noise be registered, it is the responsibility of the developer to investigate this complaint as per the following sections. Should a noise complaint be registered it is recommended that a noise investigation be done by an independent acoustic consultant.

While this section recommends a noise monitoring programme, it should be used as a guideline as site specific conditions may require that the monitoring locations, frequency or procedure be adapted.

24.1 Measurement Localities and Procedures

24.1.1 Measurement Localities

No routine noise measurements or locations are recommended. Noise measurements must be conducted at the location of the person that registered a valid and reasonable noise complaint. The measurement location should consider the direct surroundings to ensure that other sound sources cannot influence the reading. A second instrument must be deployed at a control point away from the potential noise source during the measurement period.

24.1.2 Measurement Frequencies

Once-off measurements if and when a reasonable and valid noise complaint is registered. Results and feedback must be provided to the complainant. If required and recommended by an acoustic consultant, there may be follow-up measurements or a noise monitoring programme can be implemented.

24.1.3 Measurement Procedures

Ambient sound measurements should be collected as defined in SANS 10103:2008. Due to the variability that naturally occurs in sound levels at most locations, it is recommended that semi-continuous measurements are conducted over a period of at least 24 hours, covering at least a full day- (06:00 – 22:00) and night-time (22:00 – 06:00) period.

Measurements should be collected in 10-minute bins defining the 10-minute descriptors such as $L_{Aeq,I}$ (National Noise Control Regulation requirement), $L_{A90,f}$ (background noise level as used internationally) and $L_{Aeq,f}$ (Noise level used to compare with IFC noise limit). Spectral frequencies should also be measured to define the potential origin of noise. When a noise complaint is being investigated, measurements should be collected during a period or in conditions similar to when the receptor experienced the disturbing noise event.

24.2 Relevant Standard for Noise Measurements

Noise measurements must be conducted as required by the National Noise Control Regulations (GN R154 of 1992) and SANS 10103:2008. It should be noted that the SANS standard also refers to a number of other standards.

24.3 Data Capture Protocols

24.3.1 Measurement Technique

Noise measurements must be conducted as required by the National Noise Control Regulations (GN R154 of 1992) and SANS 10103:2008.

24.3.2 Variables to analyse

Measurements should be collected in 10-minute bins defining the 10-minute descriptors such as $L_{Aeq,I}$ (National Noise Control Regulation requirement), $L_{A90,f}$ (background noise level as used internationally) and $L_{Aeq,f}$ (Noise level used to compare with IFC noise limit). Noise levels should be co-ordinated with the 10-m wind speed. Spectral frequencies should also be measured to define the potential origin of noise.

24.3.3 Database Entry and Backup

Data must be stored unmodified in the electronic file saved from the instrument. This file can be opened to extract the data to a spread sheet system to allow the processing of the data and to illustrate the data graphically. Data and information should be safeguarded from accidental deletion or corruption.

24.3.4 Feedback to Receptor

A measurement report must be compiled considering the requirements of the National Noise Control Regulations (GN R154 of 1992) and SANS 10103:2008. The facility must provide feedback to the potential noise-sensitive receptors using the channels and forums established in the area to allow interaction with stakeholders, alternatively in a written report.

24.4 Standard Operating Procedures for Registering a Complaint

When a noise complaint is registered, the following information must be obtained:

- Full details (names, contact numbers, location) of the complainant;
- Date and approximate time when this non-compliance occurred;
- Description of the noise or event; and
- Description of the conditions prevalent during the event (if possible).

25 HERITAGE MANAGEMENT PLAN

The purpose of this heritage management plan (HMP) is to provide a framework, under the EMPr, for the management of heritage resources during the construction, operation and decommissioning of the San Kraal WEF.

The objective of the HMP is to put in place clear and practical management actions to ensure that heritage resources within the WEF development are protected and conserved and, where they occur, impacts to these resources are appropriately managed and mitigated.

The HMP identifies the below:

- What heritage resources require management;
- Who will carry out the management of heritage resources;
- Appropriate management and mitigation actions to be implemented to ensure that heritage resources are not negatively impacted during the construction, operation and decommissioning of the WEF; and

- Procedures and processes to follow in the event of negative impact to previously identified or new discovered heritage resources during the construction, operation and decommissioning of the WEF.

25.1 Heritage Resources Requiring Management

The known heritage resources within the San Kraal WEF identified in the HIA and the pre-construction walkdown report are listed in Appendix E and consist of MSA and LSA archaeological occurrences or sites and a number of historical period kraals and ruins.

These heritage sites and materials are protected by the National Heritage Resources Act (NHRA) (25 of 1999) which provides protection for various categories of heritage resource from unauthorised disturbance, damage, or destruction, thereby ensuring their protection and preservation for the future.

The identified heritage resources within the San Kraal WEF have been graded, in terms of the provisions of section 3 of the NHRA and the gradings for each site are shown in Appendix E. Grading provides an indication of the significance and heritage value of a heritage resource and, in the context of a development such as the San Kraal WEF, is key to the management of such resources.

25.2 Responsibility for the Management of Heritage Resources

The San Kraal WEF is located in the Northern Cape and therefore, falls under the jurisdiction of the Northern Cape Provincial Heritage Resources Authority (NCHRA). However, the management of archaeological resources in the Northern Cape is currently undertaken by the South African Heritage Resources Agency (SAHRA), on behalf of the provincial agency. Any management of heritage resources within the Northern Cape must, therefore, follow the prescripts of the NHRA and the processes established by SAHRA.

The contact details for NCHRA and SAHRA are:

Northern Cape Heritage Resources Authority (NCHRA)		
Contact Person	Mr Ratha Andrew Timothy	
Tel	+27 53 833 1435	
Email	rtimothy@nbkb.org.za	
NCHRA Website	https://www.nbkb.org.za/	
South African Heritage Resources Agency (SAHRA)		
Contact Person	Ms Natasha Higgitt	Mr P Hine
Tel	021 4624502	
Email	nhiggit@sahra.org.za	phine@sahra.org.za
SAHRA Website	www.sahra.org.za	

The ultimate responsibility for ensuring that heritage resources within the boundaries of the WEF are appropriately protected and managed during construction, operation and decommissioning rests with the Developer, San Kraal Wind Power (Pty) Ltd.

In terms of the organisational structure set out in this EMPr, a Contractor, ESO and ECO will be appointed to monitor the project compliance with the EMPr and conditions of the environmental authorisation.

The ESO is expected to be in constant liaison with contractors and WEF staff will be the key person responsible for ensuring the effective day to day management of heritage

resources for the project. Based on the responsibilities set out in the EMPr, therefore, in respect of heritage resources the ESO will be expected to:

- Monitor, on a daily basis, the implementation of and compliance with the heritage management specifications and mitigation measures set out in the EMPr;
- Keep a register of compliance / non-compliance with the heritage management specifications;
- Identify and assess previously unforeseen, actual or potential impacts on heritage resources; and
- Ensure that a brief monthly heritage management monitoring report is submitted to the ECO.

25.2.1 Potential Impacts to the identified Heritage Resources: Construction, Operational and Decommissioning Phases

Sixteen (16) sites found in 2017 and listed in Appendix E remain within the final boundary of the amended San Kraal WEF, although changes to the layout and cable/ road alignments, mean that the WEF will now not impact any of these sites.

Two of the three additional sites identified in the 2019 field survey within the footprint of the San Kraal WEF (JG036 and JG037) were located close to the proposed position of WTG 409. This WTG has been shifted slightly to the west in the final WEF layout and the likelihood of impact to the packed stone 'wolwehok' (JG036) is thus reduced.

No further heritage occurrences that will be subject to impact from the final layout of the San Kraal WEF were recorded during the 2021 walkdown survey.

Thus, there are unlikely to be impacts to any of the identified heritage resources arising from the construction, operation and decommissioning of the WEF but the following no-go areas/ exclusion zones must be implemented:

- A 50 m no-go area around the JG017-JG019;
- A 30 m no-go area around the JG036; and
- The exclusion zone/ no-go area placed around the historical farm complex JR003, JR004, JR006 and JR007 (J143-148, J149-155, J156-166, G032-040 in 2021) must be retained and implemented.

No other site-specific archaeological mitigation measures have been recommended for the WEF, but the following general measures must be implemented to ensure that there are no negative impacts to heritage resources during the various phases of the development:

- Currently unidentified archaeological sites, artefacts and structures may be present within the San Kraal WEF and may be subject to impacts arising from activities associated with the construction, operation and decommissioning of the WEF.
- In the unlikely event that archaeological material, rock art or rock engravings or historical structures are encountered during the construction of the WEF, work must cease in the vicinity, they must be cordoned off and left *in situ*. SAHRA must be informed of the discovery and a suitably qualified archaeologist must be called in to investigate the occurrence so that a decision can be made about how to deal with it.
- The identified stone-built structures and any others encountered within the WEF must be protected from vandalism or damage and no stone may be robbed from such structures.
- In the event that human remains are uncovered during the construction of the WEF, the Contractor must immediately stop work in that area and notify the ECO and/ or ESO who must ensure that the remains are made secure and left *in situ*. The project archaeologist and SAHRA must immediately be informed of the find so that a decision can be made about how to mitigate the remains. This may require inspection by the archaeologist to determine whether mitigation should take place and what form that

mitigation should take. An application to SAHRA for an emergency permit for the archaeologist to excavate and recover the remains may also be required.

25.2.1.1 Staff and Contractor Awareness

The ESO must ensure that the Contractor(s) and all site staff are made aware of the heritage resources on the site, the mitigation measures set out above, and the steps to take of human remains or new archaeological material is encountered on site.

This information should be presented in the site induction programme for project staff and in any refresher programmes that may be occur.

25.2.2Revision of the HMP

This HMP included in the EMPr is a living document that can and must be reviewed and updated to reflect any changes to the heritage information for the site or the management protocols set out above.

The HMP must be revised every five (5) years, or more regularly should circumstances require it.

26 FOSSIL FIND PROTOCOL

The following Monitoring Programme for Palaeontology is only required if fossils are seen on the surface and when excavations commence.

- When excavations begin the rocks must be given a cursory inspection by the ESO or contractor. Any fossiliferous material (plants, insects, bone, trace fossils) should be put aside in a suitably protected place. This way the project activities will not be interrupted.
- Photographs of similar fossil plants must be provided to the ESO and ECO to assist in recognizing the fossil plants in the shales and mudstones. This information must be built into the EMPrs training and awareness plan and procedures.
- Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
- If there is any possible fossil material found, a qualified palaeontologist should be sub-contracted and visit the site to inspect the selected material and check the dumps where feasible.
- Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits.
- If no good fossil material is recovered then no site inspections by the palaeontologist will be necessary. A final report by the palaeontologist must be sent to SAHRA once the project has been completed and only if there are fossils.
- If no fossils are found and the excavations have finished then no further monitoring is required.

27 FUEL STORAGE MEASURES

27.1 Storage Tanks

The storage tanks will be within contained areas to prevent spills contaminating soil and water, and with a design to capture and contain a volume of spill of at least 110% of the volume of stored fuel. These containers can be built in concrete and painted with anti-

corrosive paint. The floor of the container must be inclined to permit the collection of the spilled liquids.

The storage tanks must also have a cover protection on top, prepared for drainage and collection of run-off.

27.2 General Procedures

- Transport routes for the transport of fuel will be clearly indicated;
- Pollution control equipment (spill and leak cleaning kits) must be readily available;
- Ensure personnel training, including: measures to prevent fuel spills, to treat/clean fuel spills, how to react on spill of flammable liquids on clothing and in the inhalation of vapours, leaks simulations; fuel vapour recovery processes, etc. Keep records of all training;
- Maintain the premises and equipment in a clean and tidy state;
- Regularly clean outdoor areas with a broom;
- Wastewater from outside areas must be directed to the contaminated water drainage system, and not enter the storm water system;
- Used oils (waste oil) will be collected, re-used, stored and disposed of in line with disposal procedures for hazardous wastes; and
- Ensure the proper management of other hazardous wastes (contaminated soils, used spilling kits, waste lube, etc.).

Filling operations

- Isolate the area by cones and a rope;
- Prohibit refuelling operations during tank filling operations;
- Avoiding having people who are not involved in the operation within a 10 metre radius;
- Prohibit smoking and the use of mobile telephones or any other ignition sources during tank filling operations or vehicle refuelling, within a 3 metre radius;
- Use a tight-fill cap to completely seal off the connections between the tubing and the trucks and stations tanks;
- Engines must be turned off during refuelling; and
- Prevent overflowing and spilling situations when the storage tanks are being filled (verify filling sensors and be aware of overflow alarms).

Preventing Accidents with fuel mixtures

Establish a procedure to deal with the potential occurrence of these situations, such as:

- The chemicals and reaction mechanisms associated with the substances mixed or blended must be well understood and documented;
- Chemical and process hazards must be understood and addressed and the facilities should ensure that process equipment, controls, and procedures are designed, installed and maintained to safely operate the process;
- All employees should understand the chemical and process hazards;
- Facilities should establish a system for Standard Operating Procedures and ensure that they are understood and followed;
- Display clear and informative messages for users of the station, as to how to deal with this situation; and
- Prepare a procedure to suitably dispose of wastes recovered from the batches of fuel mixture.

Spill Kits

- Emergency spill kits of absorbent material (e.g., sand) must be provided and stored next to the higher risk sites, and must be easily-accessible, ideally outside, in order to

allow an immediate response when a spill occurs. This will be clearly labelled and ready for use.
- Drums for the storage of contaminated material must be provided.
- An accurate drawing of the local drainage system shall be posted next to the spill kit.

Closure Phase

- During the closure phase, there may be loss of product into the soil, as a result of a deliberate or accidental release during closure and removal of tanks and tubing. In addition, this risk may arise outside of the facility site, if the tanks and/or tubing are not properly disposed of.
- In the closure phase, it is important to remove all tanks and pipes. A risk may arise if the tanks are left on site with residual products. As the integrity of the equipment will no longer be ensured or monitored.
- During closure, it must be ensured that facilities do not present a risk to the environment, health or safety. Measures must be taken to ensure that the closure does not result in an unacceptable risk, including:
  - Any and all waste products will be removed from the tanks. Care will be taken to ensure that no product is lost into the soil. Tank closure must be carried out safely, with the removal of explosive vapours, for example by filling the tanks with water or inert gases. All tanks will be safe prior to their removal from the ground. Similar methods will be employed prior to the removal of the pipes.
  - Water used in this process will be contaminated with residual product, and thus a water contamination risk may arise if the contaminated water is not disposed of in a way which is appropriate for hydrocarbon contamination. This would normally imply the removal to a suitable waste handling facility.
  - According to best environmental practices, the tanks, tubing and distributors will be disposed of. However, if the tanks remain in situ, it will be ensured that the procedure is safe. After making the tanks inert and safe, they will be filled in with sand, concrete, inert mud or hydrophobic foam.
  - The tanks and associated tubing which are no longer considered appropriate or safe for fuel storage will not be used for storage of other hydrocarbons, without first ensuring their integrity.
  - The oil/water separators will be removed for disposal, off the facility site. Otherwise they will be filled in a similar way to the tanks. Regardless of the fate of the oil/water separator, all liquid and mud waste will be removed (off the facility site) and all the inlets and outlets will be sealed.
  - Whatever drainage system left behind will be modified to ensure that it does not serve as a path for pollutants to reach groundwater or other waters.
  - If the deactivation is temporary, product can be left in the tanks. In this case, all monitoring procedures will be carried out as if the facility were in operation. If for any reason the monitoring cannot carry on, the tanks will be emptied and made inert.
  - Personnel involved in the closure of a filling and fuel station will be aware and respect obligations with regards to waste disposal, in line with the best practices described above.

Environmental Aspect	Action or Measure
Prevent accidental spills from entering the stormwater drainage system	Provide cleaning equipment conceived specifically to deal with minor spills as may occur at the station. Place a clearly-identified spill kit in a visible location for each fueling line.
	Develop a step-by-step guide to use of the spill kit.
	Develop an evacuation plan and/or response procedures for emergencies involving large fuel spills.

	Train the whole team in the emergency response procedures. Make sure that all staff knows where the emergency equipment is to be found and is acquainted with its maintenance.
	Label all of the stormwater drains on site in the proximity of the facilities as "Clean Water Only".
	Inspect the fuel distribution area in order to confirm that rainwater drained or emptied from the roof doesn't enter the areas marked out.
	Check whether the embankment around the fuel distribution area is in good condition and has the capacity to contain a fuel leak in the event of an emergency.
Minimise the risks of environmental contamination and from issues of workers' health and safety	Provide training to the staff regarding the disposal of material contaminated with fuel, such as absorbent material from the spill kit, soaked in fuel.
	Ensure that the product safety cards for all fuels and oils are up-to-date and accessible at all times.
Minimise the risks of fuel leaks as may result in pollution of the sub-soil and groundwater	Check if there is fuel, from a possible leak, in the spill containment sumps installed at the tank's discharge nozzle.
	Check if there is fuel, from a possible leak, in the all tanks containment sumps, installed on the manhole to the storage tanks. In the event of suspected leakage, report it immediately.
	Check if there is fuel or lube, from a possible leak in the containment sumps installed under the tanks.
Minimise the risks of fuel leaks as this may result in pollution of the sub-soil and groundwater	Check if there is fuel, from a possible leak, in the chambers of the containment sumps installed under the pumps
Minimise the risks of harmful emissions to the atmosphere and the loss of fuel	Check that lids, flanges and connections are closed.
	Confirm that the ventilation conduits are not blocked.
	Supervise the fuel deliveries.
Minimise the risks of water pollution	Carry out an Oil-Water Separator inspection to ensure effective treatment.
Integrity control	Adequate maintenance and calibration of the monitoring equipment

28 CONCLUSION

In terms of the National Environmental Management Act, 1998 (Act 107 of 1998) everyone is required to take reasonable measures to ensure that they do not pollute the environment. Reasonable measures include informing and educating employees about the environmental risks of their work and training them to operate in an environmentally acceptable manner.

Although all foreseeable actions and potential mitigation measures and management actions are contained in this document, the EMPr should be seen as a day-to-day management document. The EMPr thus sets out the environmental and social standards, which would be required to minimise the negative impacts and maximise the positive benefits of the San Kraal WEF. The EMPr could thus change daily, and if managed correctly lead to successful construction and operational phases of the development.

Furthermore, in terms of the 'Act', the cost to repair any environmental damage shall be borne by the person responsible for the damage. It is therefore imperative that the management plan is successfully implemented, as a failure to comply could have legal implications. The environmental impacts on the site will not be significant if the construction management is well implemented, and a set of operational guidelines are developed by the long term site management body.