ZEN WIND FARM
WESTERN CAPE PROVINCE

ENVIRONMENTAL MANAGEMENT PROGRAMME

Revision 1

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PROJECT DETAILS

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DEFINITIONS AND TERMINOLOGY

Alien species: A species that is not indigenous to the area or out of its natural distribution range.

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process, or technology alternatives, temporal alternatives or the 'do nothing' alternative.

Ambient sound level: The reading on an integrating impulse sound level meter taken at a measuring point in the absence of any alleged disturbing noise at the end of a total period of at least 10 minutes after such meter was put into operation.

Assessment: The process or collecting, organising, analysing, interpreting and communicating information which is relevant.

Biological diversity: The variables among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes they belong to.

Commence: The start of any physical activity, including site preparation and any other activity on site furtherance of a listed activity or specified activity, but does not include any activity required for the purposes of an investigation or feasibility study as long as such investigation or feasibility study does not constitute a listed activity or specified activity.

Cumulative impacts: Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (e.g. discharges of nutrients and heated water to a river that combine to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period and can include both direct and indirect impacts.

Cut-in speed: The minimum wind speed at which the wind turbine will generate usable power.

Cut-out speed: The wind speed at which shut down occurs.

Decommissioning: To take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned. This usually occurs at the end of the life of a facility.

Department: means the Department of Forestry, Fisheries and the Environment.

Development footprint: in respect of land, means any evidence of its physical transformation as a result of the undertaking of any activity.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These

impacts are usually associated with the construction, operation, or maintenance of an activity and are generally obvious and quantifiable.

Disturbing noise: A noise level that exceeds the ambient sound level measured continuously at the same measuring point by 7 dB or more.

'Do nothing' alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

Ecosystem: A dynamic system of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Endemic: An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

Environment: the surroundings within which humans exist and that are made up of:
The land, water and atmosphere of the earth;
Micro-organisms, plant and animal life;
Any part or combination of (i) and (ii) and the interrelationships among and between them; and
The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental assessment practitioner: An individual responsible for the planning, management and coordinating of environmental management programme or any other appropriate environmental instruments introduced by legislation.

Environmental Impact: An action or series of actions that have an effect on the environment.

Environmental impact assessment: Environmental Impact Assessment (EIA), as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

Environmental management: Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental management inspector: A person designated as an environmental management inspector in terms of section 31B or 31C on the National Environmental management Act 107 of 1998.

Environmental management programme: An operational plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its on-going maintenance after implementation.

Generator: The generator is what converts the turning motion of a wind turbine's blades into electricity.

Habitat: The place in which a species or ecological community occurs naturally.

Hazardous waste: Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment (Van der Linde and Feris, 2010;pg 185).

Indigenous: All biological organisms that occurred naturally within the study area prior to 1800

Indirect impacts: Indirect or induced changes that may occur because of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place because of the activity.

Interested and affected party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups, and the public.

Nacelle: The nacelle contains the generator, control equipment, gearbox, and anemometer for monitoring the wind speed and direction.

Pollution: A change in the environment caused by substances (radio-active or other waves, noise, odours, dust or heat emitted from any activity, including the storage or treatment or waste or substances.

Pre-construction: The period prior to the commencement of construction, which may include activities which do not require Environmental Authorisation (e.g. geotechnical surveys).

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare."

Red data species: Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

Rotor: The portion of the wind turbine that collects energy from the wind is called the rotor. The rotor converts the energy in the wind into rotational energy to turn the generator. The rotor has three blades that rotate at a constant speed of about 15 to 28 revolutions per minute (rpm).

Significant impact: An impact that by its magnitude, duration, intensity, or probability of occurrence may have a notable effect on one or more aspects of the environment.

Tower: The tower, which supports the rotor, is constructed from tubular steel. It is approximately 80 m tall. The nacelle and the rotor are attached to the top of the tower. The tower on which a wind turbine is mounted is not just a support structure. It also raises the wind turbine so that its blades safely clear the ground and so it can reach the stronger winds at higher elevations. Larger wind turbines are usually mounted on towers ranging from 40 to 100 m tall. The tower must be strong enough to support the wind turbine and to sustain vibration, wind loading and the overall weather elements for the lifetime of the wind turbine.

Waste: Any substance, whether or not that substance can be reduced re-used, recycled and recovered; that is surplus, unwanted, rejected, discarded, abandoned or disposed of which the generator has no further use for the purposes of production. Any product which must be treated and disposed of, that is identified as waste by the minister of Environmental affairs (by notice in the Gazette) and includes waste generated by the mining, medical or other sectors, but: A by-product is not considered waste, and portion of waste, once re-used, recycled and recovered, ceases to be waste (Van der Linde and Feris, 2010; pg 186).

Wind power: A measure of the energy available in the wind.

Wind speed: The rate at which air flows past a point above the earth's surface.

ABBREVIATIONS AND ACRONYMS

DFFE	National Department of Forestry, Fisheries, and the Environment
DWS	Department of Water and Sanitation
DHSWS	Department of Human Settlements, Water and Sanitation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EPC	Engineering Procurement Contractor
ECO	Environmental Control Officer
EO	Environmental Officer
GG	Government Gazette
GN	Government Notice
Ha	Hectare
I&AP	Interested and Affected Party
km^2	Square kilometres
kV	Kilovolt
m^2	Square meters
m/s	Meters per second
MW	Mega Watt
NEMA	National Environmental Management Act (Act No 107 of 1998)
NHRA	National Heritage Resources Act (Act No 25 of 1999)
NIRP	National Integrated Resource Planning
NWA	National Water Act (Act No 36 of 1998)
PM	Project Manager
SHE	Safety, Health and Environment
SAHRA	South African Heritage Resources Agency
SANRAL	South African National Roads Agency Limited

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1 INTRODUCTION

This Environmental Management Programme has been compiled for the Zen Wind Farm. The project site is located is approximately 10km town of Gouda and approximately 4km south of Saron in the Drakenstein Local Municipality, under the jurisdiction of the greater Cape Winelands District Municipality in the Western Cape. The proposed facility is to be known as the Zen Wind Farm. A project site considered to be suitable for the development of a wind farm, with an extent of approximately 3542 hectares, was identified by the project developer. An Environmental Authorisation (EA) for the project was issued on 3 November 2016 (DFFE Ref: 14/12/16/3/3/2/322). This Revised EMPr (Revision 1) has been compiled to meet the requirements of Condition 15 of the EA[1]. The Revision 1 of the EMPr has been amended to include measures as dictated by the final site and facility layout map (refer to **Appendix A**) and the provisions of the Environmental Authorisation.

Changes to this EMPr are marked for ease of reference. All additions are underlined. Where provisions of this EMPr are no longer relevant to the project, these are shown as struck out text.

This EMPr has been developed on the basis of the findings of the Environmental Impact Assessment (EIA), and must be implemented to protect sensitive on-site and off-site features through controlling construction, operation and decommissioning activities that could have a detrimental effect on the environment, and through avoiding or minimising potential impacts. This EMPr is applicable to all FE Bonne Esperance (Pty) Ltd employees and contractors working on the pre-construction, construction, and operation and maintenance phases of the Zen Wind Farm. The document must be adhered to and updated as relevant throughout the project life cycle. This document fulfils the requirement of the EIA Regulations, 2014 (as amended) and forms part of the Final EIA report of the project.

In terms of the Duty of Care provision in S28(1) the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with this project is avoided, halted or minimised. In terms of NEMA, it has become the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts. While no permitting or licensing requirements arise directly by virtue of the Zen Wind Farm, this section will be applicable throughout the life cycle of the project.

[1] The EMPr has been made available for comments by registered Interested and Affected Parties. The revised EMPr is to be submitted to the Department for written approval prior to commencement of the activity. Once approved the EMPr must be implemented and adhered to.

2 PROJECT DETAILS

The Zen Wind Farm project is to be developed on a site located that is approximate 10km to the town of Gouda and approximately 4km south of Saron in the Drakenstein Local Municipality, under the jurisdiction of the greater Cape Winelands District Municipality in the Western Cape (refer to **Figure 2.1**). The wind farm is to be known as the Zen Wind Farm. The facility site is situated adjacent to the R44. This allows for ease of access for the transportation of the turbine components during the construction phase.

The full extent of the project site (i.e., ~3 542 ha) was considered during the EIA process, within which the Zen Wind Farm has been appropriately located from a technical and environmental sensitivity perspective. The project site consists of the properties as listed in below.

» Portion 1 of the Farm Bonne Esperance 83,
» Portion 2 of the Farm Bonne Esperance 83,
» Portion 9 of the Farm No. 88
» Portion 0 of the Nayoth 458

Due to the proximity to the Bergriver Wind Farm and the operational Gouda Wind Farm, Acciona Energy South Africa Global (Pty) Ltd (AESAG) acquired the project from the original developers and is developing a wind farm cluster. AESAG will adopt the latest wind turbine technology available to Acciona Energy for the project. The facility layout has been designed to optimise the energy yield and considers the latest technology. The revised layout also takes into consideration the ideal point of connection to the grid, and ideal location of the 132kV on-site substation. The project will also utilise combined construction infrastructure (temporary facilities, laydown areas, batch plants) to further reduce the overall impacts of the project and the adjacent Bergriver Wind Farm.

The reduction in number and repositioning of turbines, coupled with infrastructure adjustments, ensures that the wind farm layout is optimised to both maximise operational efficiency and remain outside of identified sensitive areas. The facility layout has 10 turbines less than the previously authorised layout, and none of these are located to the east of the R44, which included more sensitive environments such as natural and semi-natural areas, elevated terrain, and irrigated centre pivots. This comprehensive approach allows for a more sustainable and effective utilisation of the wind energy resources while minimising the potential for environmental impacts. The following has been applied:

» **Decreased development footprint**: The Zen Wind Farm amended facility layout reduces the number of the wind turbines as assessed in the EIA, as well as subsequent amendments (from the original 46 turbines, to 27 turbines, to now 17 turbines). This is a reduction of 29 turbines from the original assessment, and a reduction of 10 turbines from the 2019 amendment assessment. This change significantly reduces the area occupied by the development footprint. This change is facilitated by the change in turbine technology, which allows for a larger wind turbine generator to be installed, using the same turbine specifications as already authorised. As the major change to the Zen Wind Farm in terms of the amendment is the reduction in the number of turbines resulting in a decreased footprint, the changes can be seen as neutral or positive (advantage) to the social and biophysical environment. There are no disadvantages of the amended layout as compared to original layout. No

high sensitivity areas were impacted by the amended layout, and as a result no new impacts were identified.

- **Sensitive areas avoidance**: The reduction in number and repositioning of turbines takes into account all identified sensitive areas, and the optimised turbine locations avoid infringement on sensitive ecosystems, habitats, or heritage sites. The final turbine positions have been verified by specialist consultants, and all specialists have confirmed the acceptability of the revised facility layout (specialist findings are provided in Section 5, and provide motivation for the change to the facility layout). The location in areas of higher agricultural soils is acceptable as the disturbance is within the define allowable limits and makes use of existing access roads where possible.
- **Operational efficiency**: The repositioning aims to maximise the operational efficiency of the wind farm. This involves analysing factors such as wind patterns, terrain conditions, and potential obstructions. By strategically placing the turbines in areas with optimal wind resources and minimal obstructions, the overall energy production of the wind farm can be enhanced.
- **Infrastructure adjustments**: Along with repositioning the turbines, the new design also involves making necessary changes to associated infrastructure. This includes taking into consideration that the optimal point of connection to the grid is via a 132kV collector on-site substation located on the Bergriver Wind Farm site. This allows for the reduction in impact to the Zen Wind Farm site by removing the need for an additional on-site facility substation in this wind farm cluster/area. These adjustments are aimed at improving the overall functionality and performance of the wind farm.

The EIAr and all specialist studies assessed the full extent of the project development area, which remains unchanged with this optimisation of the facility layout. However, addition mitigation was given to include in the EA.

A development footprint of <**22ha** has been identified within the project site and assessed for the construction of the facility and its associated infrastructure. The optimal position for each turbine and associated infrastructure (including 17 wind turbines, access roads (8m in width), shared facility substation and O&M buildings, laydown area) was determined to optimise the energy generating potential of the wind resource while also minimising impacts on environmental sensitivities.

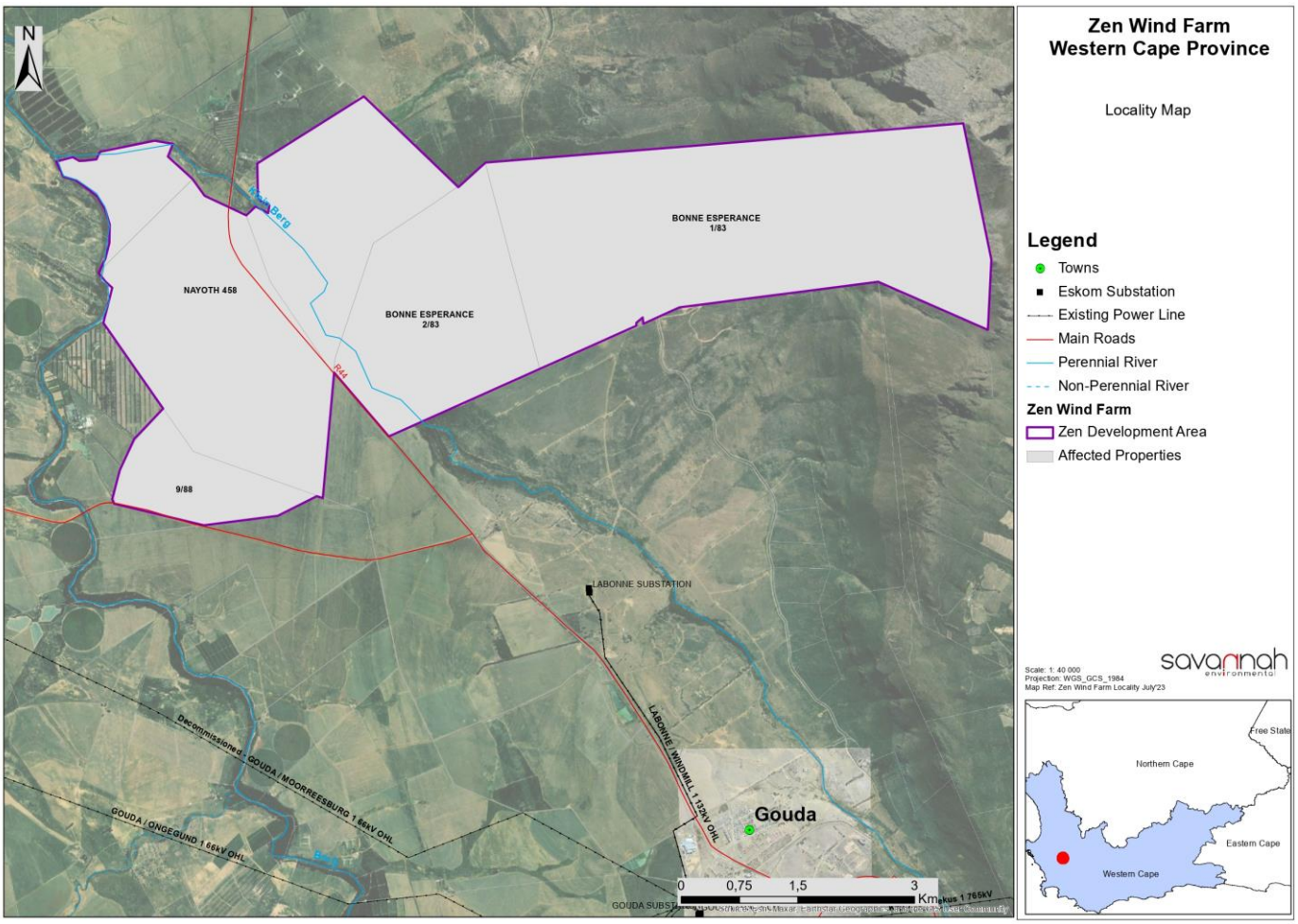


Figure 2.1: Locality map showing the location of the project site proposed for the Zen Wind Farm

2.1 Components of the Zen Wind Farm

The development footprint is proposed to accommodate the wind turbines and all associated infrastructure which is required for such a facility, and will include:

The Zen Wind Farm project site is proposed to accommodate the following infrastructure:

- Up to 17 wind turbines with each turbine being up to 7.5MW in capacity
- Cabling between the turbines, to be laid underground where practical
- Internal access roads (up to 8m in width) linking wind turbines and other infrastructure on the Bergriver Wind Farm site.

The Zen Wind Farm and Bergriver Wind Farm will share the following infrastructure:

- Temporary facilities, laydown areas and batch plants
- Onsite Substation, BESS and operational and maintenance (O&M Hub);
    - An on-site facility substation
    - A battery Energy Storage System (BESS)
    - Temporary concrete batching plant; and

- Operation and maintenance buildings including a gate house, security building, control centre offices, warehouses, a workshop and visitors centre.

Table 2.2: Details or dimensions of the Zen Wind Farm and associated infrastructure:

Infrastructure	Footprint and dimensions
Facility capacity	Contracted capacity of 147MW
Number of turbines	Up to 17 turbines
Turbine tip height	Up to 230m
Turbine foundations	Approximately 20m x 20m to a depth of 6m per turbine
Access and internal roads	Existing roads on farm will be used where feasible and practical. The width of the access road will be approximately 8m (this is also relevant for existing roads) however during construction access roads may be up to 10m in width. The total length of access roads is approximately. The access roads will be gravel.
Underground cabling	Underground cabling between the turbine will be installed at a depth of 1.5m to 3m. Cabling to follow internal access roads.

2.2. Findings of the Environmental Impact Assessment Report

The EMPr has been developed based on the findings of the EIA as well as studies undertaken for subsequent amendments to the Environmental Authorisation, and must be implemented to protect sensitive on-site and off-site features through controlling construction and operation activities that could have a detrimental effect on the environment, and through avoiding or minimising potential impacts.

A site of 35km^2 was considered for the facility, of which ~1% will be utilised for the development footprint of the wind energy facility, and will be permanently transformed. Permanently affected areas include the turbine footprints and associated infrastructure, as well as the internal power line routes and the internal access roads.

The potential for change in the significance and/or nature of impacts based on the proposed amendments as described within this motivation report is discussed below and detailed in the specialists assessment letters and reports (as applicable) contained in **Appendix A-H**[2]. This section of the main report must be read together with the specialist reports contained in **Appendix A-H** in order for the reader to obtain a complete understanding of the proposed amendments and the implications thereof. Additional mitigation measures recommended by the specialists have been included within the Environmental Management Programme (EMPr) for the project, which is revised and submitted in terms of the requirements of Condition 15 of the EA. Additions and/or changes to the EMPr are underlined and summarised for ease of reference.

Impacts on Birds and Bats

Enviro-Insight, the Birds and Bats specialists that conducted the original Environmental Impact Assessment (EIA), conducted a field survey on 17-18 April 2023 to verify the current status of the environment. This survey enabled the specialist to determine whether any changes have occurred since the initial assessment and provide a statement supported by a site verification survey.

A combined Birds and Bats report was considered to be most appropriate by the specialist due to the Zen and Bergriver Wind Farm projects being located directly adjacent to each other. These projects are proposed to be developed as a cluster and designed to share infrastructure, thereby optimising construction expenses and timeline. The specialist took into account the changes and associated impacts together in one report. This approach is considered preferable as it allows for:

- Updating and standardisation of mitigation measures applied across both projects due to the shared landscape features between both projects (e.g. the Berg River) and therefore near-identical ecology. This ensures a comprehensive and integrated approach to managing the potential effects on birds and bats from both wind farms, providing a holistic understanding of the overall impact and facilitating coordinated mitigation efforts;
- More appropriate consideration of cumulative impacts, which can inform better decision-making and adaptive management;
- Removal of unnecessary duplication of information leading to potential confusion;

[2] It must be noted that the original specialists who undertook the EIA studies have been used for these assessments as far as possible. However, where the original specialists were not available, suitably qualified and experienced specialists have been used to provide an assessment of the proposed amendments.

» A single consolidated set of recommendations and instructions for the Applicant aiming to develop the two authorised facilities as one entity.

A total of four priority bird species were recorded during the site visit and these species are: Secretary bird, Jackal Buzzard, Ludwigs's Bustard and Blue Crane. These species are considered as a priority in relation to wind energy developments as they are at risk from collision with the spinning turbine blades. Three of these species are also considered to be species of conservation concern as they are Threatened with extinction as evaluated by the IUCN, either globally or locally (Taylor et al. 2015). As it is a requirement of the animal species protocol that observations of a species of conservation concern must be disseminated to a public database prior to the submission of the report to the client, these observation records were submitted to iNaturalist[3]. Secretary bird (Endangered) and Ludwig's Bustard (Endangered) were not observed during comprehensive surveys performed by Williams (2015) or Laurence (2022) but were predicted to occur sporadically within this region. Furthermore, Calidris (2019) also reported observations of these species.

The overall habitat and land use in the survey area surrounding the turbine layout have not significantly changed compared to the descriptions provided in the previous Environmental Impact Assessment (EIA) report. The habitat for each turbine position are in homogenous agricultural fields. All turbines are positioned within transformed agricultural fields, which are considered to have a low sensitivity for avifauna and bats.

The Zen Wind Farm study, which was conducted in 2013 with an update in 2015 only recommended a 200m buffer for sensitive habitats (Bio3 2013). This buffer is considered insufficient given the advanced understanding of the impacts to birds and bats from wind turbines, and a 500m buffer for rivers or waterbodies is now recommended. This brings the Zen Wind farm's sensitivity buffer in line with that applied to the adjacent Bergriver Wind Farm. A consistent buffer across both Zen and Bergriver wind farm sites has been recommended and applied, and each habitat is required to be buffered according to the largest recommended buffer by the specialist studies. The amended layout (refer to **Figure 2.2**) confirms that there are no overlaps between the positions of the turbine bases, their blade reaches, and the consolidated areas of high sensitivity for bats and birds for the Zen Wind Farm. Consequently, the amended facility layout, with its finalised turbine positions is considered to comply with the requirements for infrastructure siting in relation to birds and bats.

Assessment of Amended Facility Layout

The potential impacts to avifauna and bats were reviewed and found to be relevant in terms of their description and evaluation of significance to the amended turbine layout. Therefore, there are no changes in the significance of assessed impacts, and no additional impacts from the amended turbine layout are expected for the Zen Wind Farm.

Changes from the initial turbine layout are expected to reduce the likelihood of collision mortalities for both birds and bats as all turbines associated with the Zen Wind Farm are now placed at least 500m away from rivers and their riparian vegetation, leading to a reduction in both the likelihood and severity of this anticipated impact. In addition, the facility layout has 10 turbines less than the previously authorised layout, with all turbines located to the east of the R44, and away from sensitive environments such as natural and semi-natural areas, elevated terrain, and irrigated centre pivots.

[3] https://www.inaturalist.org/observations/: 156866681, 156866684, 156866682

The Birds and Bat specialist report confirms that the proposed amendment to the facility layout for the wind farm will result in no change to the significance rating of the impacts of disturbance, turbine collisions, bird mortality through collision/electrocution with power lines, disruption of movement patterns, and cumulative impacts, as they have been rated previously in the specialist assessment included in the 2019 Amendment Application for the Zen Wind Farm.

The EMPr for the Zen Wind Farm is required to be updated to include the current post-construction monitoring requirements and specify the amended sensitive habitat buffers as per the consolidated sensitivity mapping (e.g. 500 m [not 200 m] buffer from the river; **Figure 2.2** with updated sensitivity mapping provided. The following revisions to the Zen Wind Farm EMPr are recommended to address avifauna and bat requirements:

» The EMPr must specifically include the necessity for post-construction avifauna and bat monitoring as stipulated in Jenkins et al. (2015) and Aronson et al. (2020) respectively. Currently, only Jenkins et al. (2015) is referred to.
» Update requirements for bat fatality monitoring and reporting to be in line with that required by Aronson et al (2020) or refer directly to this reference to be implemented. Currently the EMPr does not appropriately stipulate the requirements for operational bat fatality monitoring and must include at minimum the following statement: "post-construction bat monitoring must take place and must be fully compliant with Aronson et al. (2020)".
» Include the mitigation options of using technology-assisted management of SOD ("Smart System" from Wildlife Acoustics), to limit bat collision fatalities as described above (currently only available for birds).
» Update reference for MacEwan et al. (2018) to the latest edition: MacEwan, K., Aronson, J., Richardson, K., Taylor, P., Coverdale, B., Jacobs, D., Leeuwner, L., Marais, W. and Richards, L. 2020. South African Bat Fatality Threshold Guidelines- 3rd ed. South African Bat Assessment Association.
» Update "Objective 4: Protection of bat species" under "Mitigation: Action/control" to include the following statement: "Develop and implement a post-construction bat monitoring programme which includes carcass searches for bats during the first two years of operation, to be fully compliant with Aronson et al. (2020). Should post- construction fatality monitoring reveal high levels of fatality, automated real-time bat monitoring and analysis systems are recommended as the primary method for automated and near-real-time bat fatality mitigation".

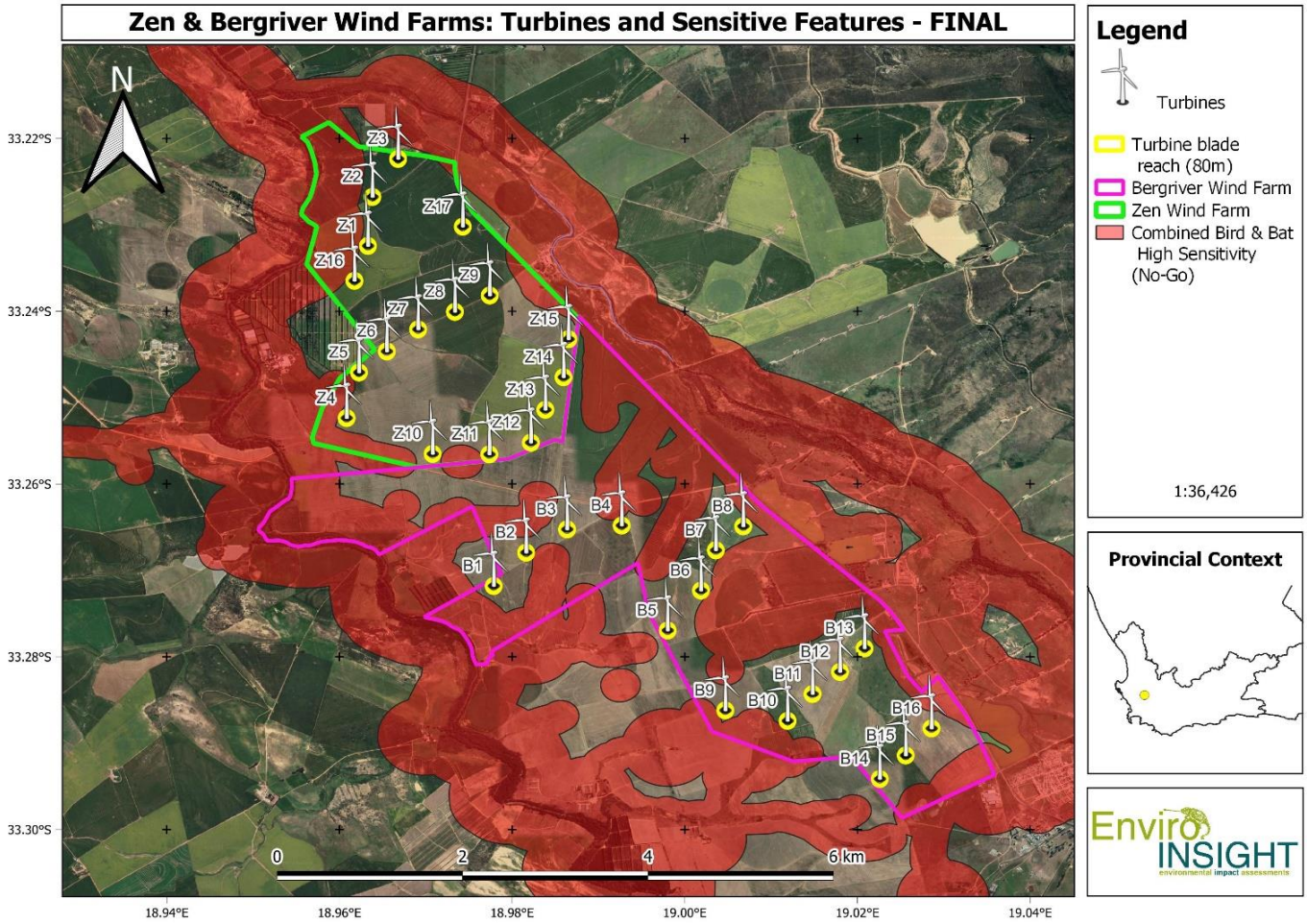


Figure 2.2: Consolidated bat and bird sensitivity mapping for the Zen & Bergriver Wind Farms, showing the final revised turbine positions which remain outside all high sensitivity areas and buffers

Cumulative Impact

The revised turbine layout of 33 turbines (considering both Bergriver and Zen Wind Farms collectively) including blade reaches, represents an area of ~2000 ha, hereafter referred to as the development footprint, which is 0.6 % of the 30 km radius area . An additional 750 ha of non-approved wind energy development area will be added by the proposed facility, as the majority of the Zen Wind Farm and the Bergriver Wind Farm project areas are already approved for wind energy developments according to REEA 2022-Q4 **Figure 2**.3 It is important to note that the development footprint area is not totally transformed during development. The total area of approved WEFs in this region (development unconfirmed, and only based on REEA 2022-Q4) represents 6.8% of the land area and with the additional 750 ha of the Zen Wind Farm and the Bergriver Wind Farm project area boundary, will increase to 7.0%. This is considered to be an acceptable level of cumulative impact, given that is a relatively small proportion of the region, utilising agriculturally transformed land only, with appropriate avoidance of sensitive habitats.

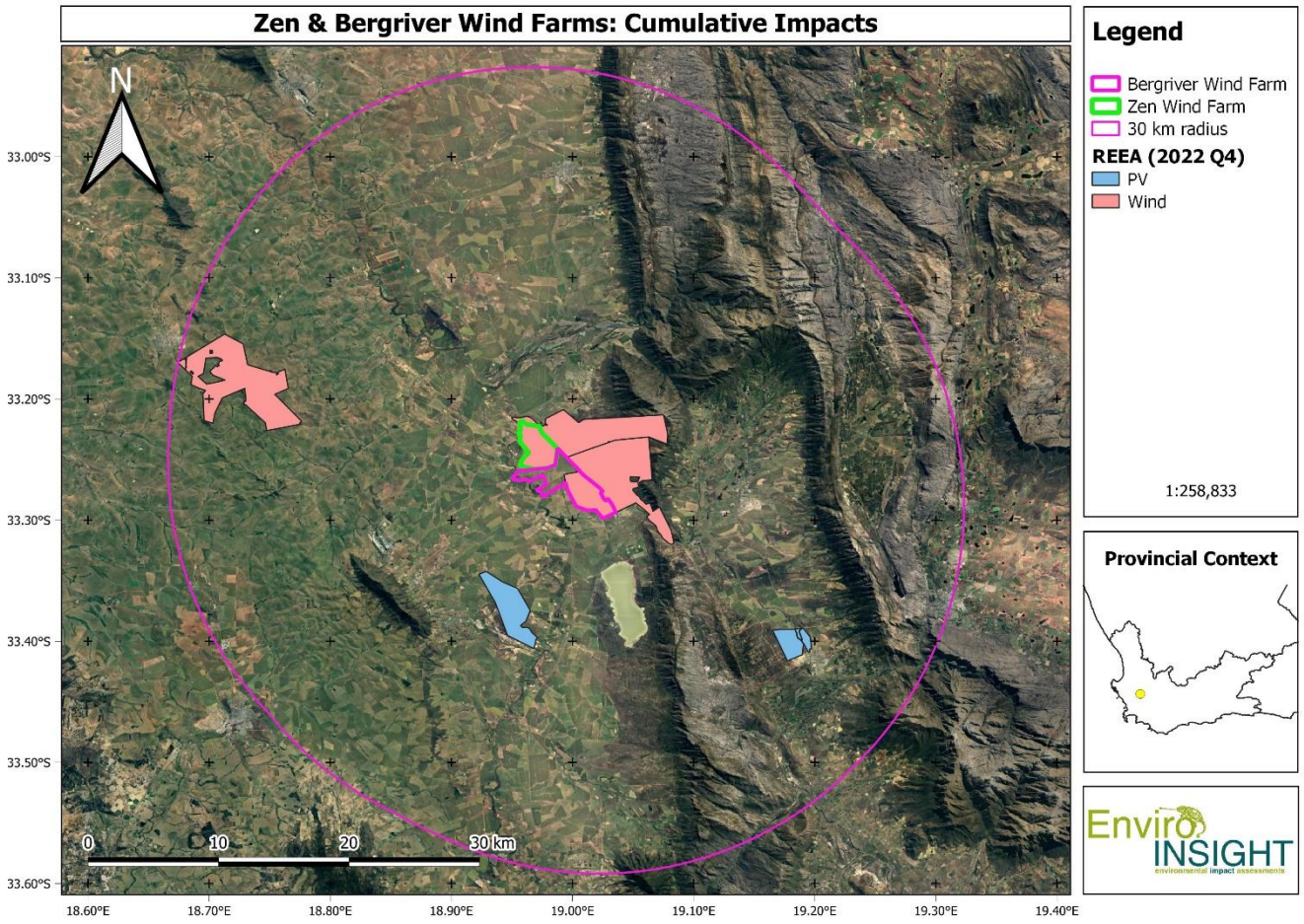


Figure 2.3: Location of the known regional renewable energy projects in relation to the proposed Zen Wind Farm and Bergriver Wind Farm

Conclusion

The amended facility layout for the Zen Wind Farm is considered suitable for development from both an avifauna and bat perspective. The Specialist confirms the acceptability of the revised facility layout, which is intended for submission to and approval by DFFE. An amendment to measures for avoiding, managing, and mitigating impacts resulting from the proposed changes, and the additions/changes to the Environmental Management Programme (EMPr) have been provided.

» ***Impacts on Aquatic Resources***

The original Environmental Impact Assessment (EIA) did not include an assessment report for the Aquatic Impacts. EnviroSci, the aquatic specialist was appointed to conduct a field survey in April 2023. The purpose of this survey was to verify/confirm the current status of the environment. The findings of this survey enabled the Specialist to provide a statement supported by a site verification survey.

The development area contains short tributaries that link to the Berg River and Klein Berg River, consisting mostly of perennial watercourses, non-perennial rivers some with valley bottom wetlands (Klein Berg) that are highly constrained by the conversion of the previously natural Swartland Shale Renosterveld to agricultural fields, i.e. the only remaining natural vegetation within the study area are these remaining wetland areas. This was confirmed in the 2023 site visit.

Overall, these wetland systems would be considered Largely Modified, however it is still important to protect these areas due to the vegetation and fauna still observed within these habitats. The ecosystem services function of the wetlands would thus also include the protection of the downstream riverine areas (Berg River) from higher levels of sediment and nutrient input if these wetlands were lost.

The National Wetland Inventory v5.2 spatial data (NWI) confirmed the presence of the wetland areas. The observed aquatic systems due to the overall habitat degradation in the region are not included in any and National Freshwater Ecosystems Priority Areas (NFEPA), Wetland Clusters or Strategic Water Resources Areas. These are however shown as Ecological Support Areas (ESA Type 2) in the Western Cape Biodiversity Spatial Plan (WCBSP) – Drakenstein Municipality. The downstream reach Berg River associated with the study area forms part of a Critical Biodiversity Area (CBA Type 1) in the WCBSP.

The only dense riparian vegetation was found along reaches of the Berg River, dominated by sedges and grasses (*Cynodon dactylon, Cyperus spp, Phragmites australis*) on the river edge, while tall trees on the steep banks were dominated by alien species (*Acacia mearnsii & Eculayptus spp)*. The wetland areas were dominated by sedges (*Ficinia littoralis, Juncus spp*) and various ruderal weeds and grass associated with the adjacent agricultural areas.

No aquatic species of special concern were observed within the development area during the time of the survey.

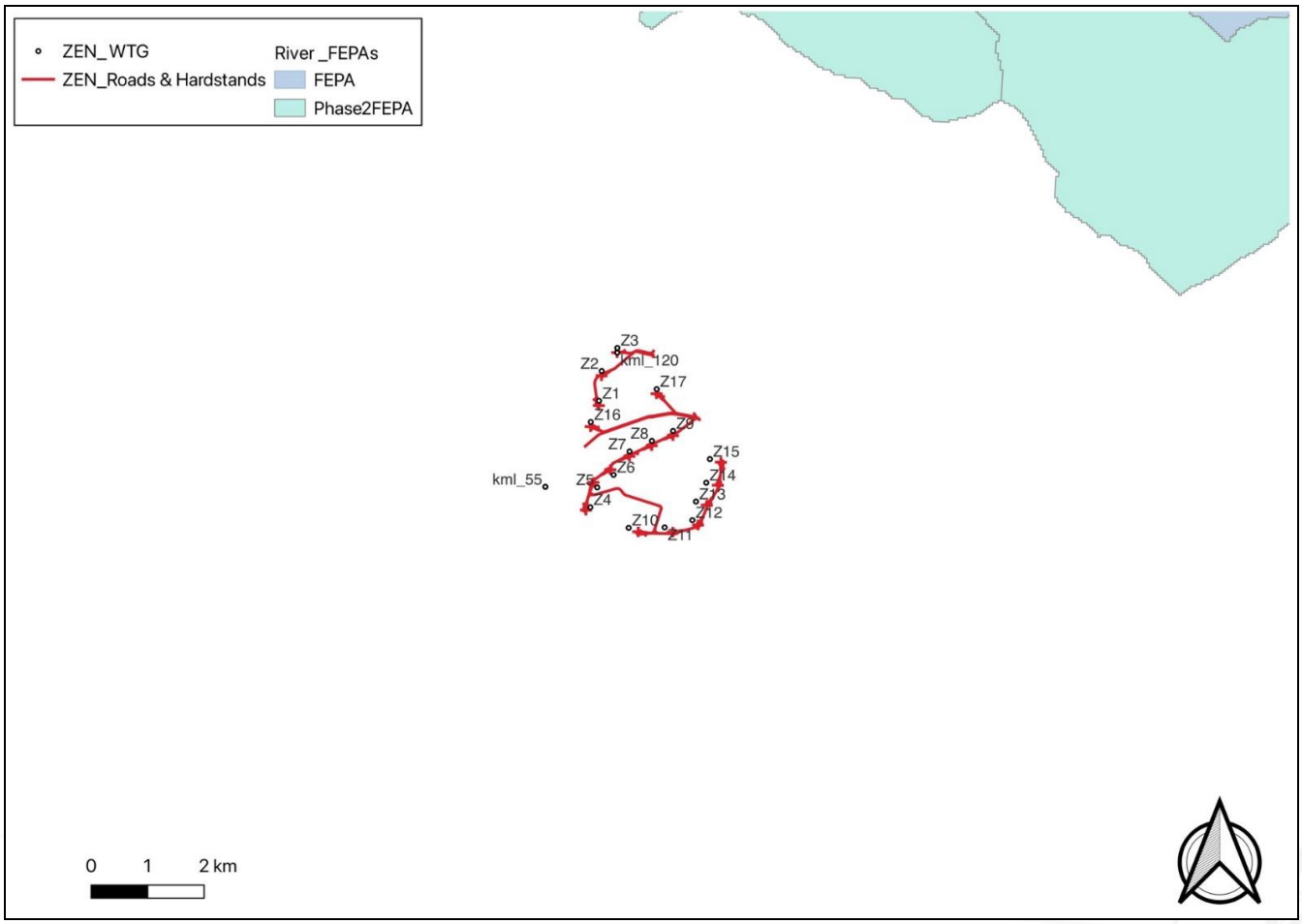


Figure 2.4: The respective sub quaternary catchments rated in terms of Freshwater Ecosystem Priority Areas (FEPAs) in relation to the development area.

Present Ecology State, conservation importance and final sensitivity rating

The Present Ecological State (PES) and the Ecological Importance and Sensitivity Scores (EIS) were based on the current state and function of the natural systems observed, or where systems contributed to the ecological character of the study area. These ratings were then translated in the respective sensitivity ratings of the various aquatic systems (High to Low), and used to prepare a sensitivity map, used in guiding the preparation of the layout.

The following summary is present of the PES/EIS score of the natural wetlands found within the area and compared to the riverine sites (no specific wetlands were included) assessed in the water resource classes and resource quality objectives (Government Notice 695, 10 May 2019):

Feature Label	Hydrogeomorphic Type	Present Ecological Sate	Ecological Importance and Sensitivity	Overall Sensitivity	Buffer as per Macfarlane & Bredin (2017) Model
Berg River with riparian zones (alien vegetation)	Riverine	D (Gazetted PES = D for this riverine reach)	High	Moderate	100m
Valley Bottom Wetland 1	Valley Bottom Wetland (portions channelled)	D	Low	Moderate	35m
Klein Berg River	Riverine	D (Gazetted PES = D for this riverine reach)	High	Moderate	35m
Valley Bottom Wetland 2	Valley Bottom Wetland (portions channelled	D	Low	Moderate	35m
Valley Bottom Wetland 3	Valley Bottom Wetland (portions channelled	D	Low	Moderate	35m

In brief the observed systems within the study area are Largely Modified (PES = D), with a Moderate Ecological Importance and Sensitivity Score, which equates to a Moderate Sensitivity rating spatially.

The facility layout avoids the observed systems (inclusive of the associated buffers) as these areas corresponded to the Very High Sensitivity systems considered in the DFFE Screening Tool spatial data (refer to **Figure 2.5).**

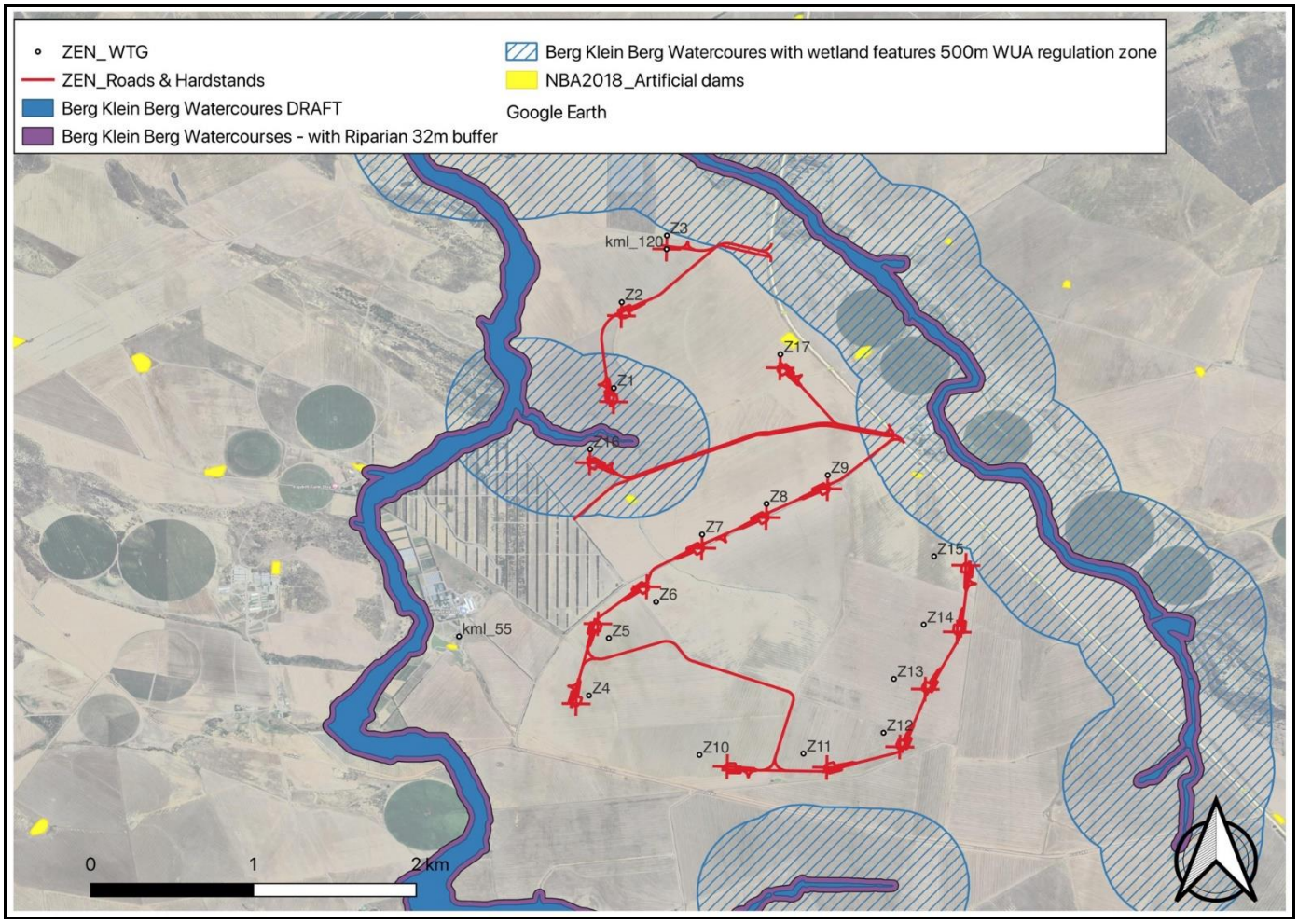


Figure 2.6: Delineated wetlands (= Moderate sensitivity areas) and watercourses (= Moderate sensitivity areas) in relation to the activities, with buffers and the 500m regulated WULA zone.

Assessment of the Amended Facility Layout

The revised layout for the facility would result in a low impact on the aquatic systems after mitigation Based on the findings of this study no objection to the amendment of the revised facility layout as provided by the developer. As the proposed activities have the potential to create erosion or impact on a freshwater system, the following recommendations are proposed to ensure are adequately included in the Environmental Management Programme (EMPr):

» Vegetation clearing should occur in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment, and suitable dust and erosion control mitigation measures should be included in the EMPr to mitigate the impact.
» All construction materials including fuels and oil should be stored in demarcated areas that are contained within berms / bunds to avoid the spread of any contamination / leaks outside of any delineated waterbodies and their buffers. Washing and cleaning of equipment should also be done in berms or bunds to trap any cement / hazardous substances and prevent excessive soil erosion. Mechanical plant and bowsers must not be refuelled or serviced within or directly adjacent to any watercourse

- An Environmental Control Officer (ECO), with a good understanding of the local flora be appointed during the construction phase. The ECO must be able to make clear recommendations with regards to the re-vegetation of the newly completed / disturbed areas along aquatic features.
- All alien plant re-growth must be monitored and should these alien plants reoccur these plants must be re-eradicated.
- A comprehensive rehabilitation plan be implemented from the project onset within watercourse areas (including buffers) to ensure a net benefit to the aquatic environment.

Conclusion

The proposed amendment will have Low impact significance ratings after mitigation. In addition to this, mitigation measures are required are to be add to the EMPr.

The amended facility layout for the Bergriver Wind Farm is considered suitable for development as the facility layout avoids the observed systems (inclusive of the associated buffers). The Specialist confirms the acceptability of the revised facility layout, which is intended for submission to and approval by DFFE.

- ***Ecological Impact***

3Foxes Biodiversity Solutions, the Ecology specialist that conducted the original Environmental Impact Assessment (EIA), verified the acceptability of the revised facility layout considering the current state of the environment. A field survey was not required, as the project site is already transformed due to agricultural activity on the site, and there are no impacts on sensitive areas.

the Zen Wind Farm includes a reduction in the number of turbines from 27 down to 17, but an increase in the road width from 6m to 8m. These would to some extent compensate for one another and the overall final footprint would decrease given that the substation has also been removed from the facility layout (the position of on-site facility substation has been optimised on the Bergriver site to enable a consolidated point of grid connection for the Zen/Bergriver wind farm cluster). The change reduces the extent of the development footprint, but remains fully within the assessed development area. No turbines are planned east of the R44 road. As such, the development would not result in an increase in the terrestrial footprint associated with the development. In addition, the project site is almost entirely transformed and the layout does not impact any potentially sensitive areas. As a result, there are no assessed differences between the current layout and the original layout as assessed within the EIA and subsequent amendments.

Assessment of Amended Facility Layout

The specialist report confirms that the impact rating, as provided in the initial assessment, remains valid. The mitigation measures provided in the initial assessment are still applicable. Measures for avoidance, management, and mitigation of impacts remain the same as those recommended in the original Environmental Impact Assessment (EIA). The proposed change falls within the assessed development footprint and does not introduce new or increased impacts. Cumulative impacts are considered to be the same as previously assessed, and the recommended mitigation and avoidance measures from the EIA still apply.

No changes are recommended for the Environmental Management Programme (EMPr), and all the mitigation and avoidance measures from the EIA are applicable to the amended layout.

Conclusion

The change in the facility layout and the position of on-site facility substation associated with the proposed amendment to the Bergriver Wind Farm EA is supported from an ecological point of view as the change would not generate novel impacts or increase the severity of existing impacts associated with the development. No additional mitigation or avoidance measures, beyond those already recommended in the EIA study are required for the amendment. As such, there are no reasons to oppose the proposed amendment. In addition, the Specialist confirms the acceptability of the amended facility layout (for submission to and approval by DFFE), and that no additions/changes to the Environmental Management Programme (EMPr) are required.

Impacts on Soil and Agricultural Potential

The original assessment was conducted and submitted by J.H. van der Waals of Terra Soil Science (January 2012). TerraAfrica Consult, the Soil and Agriculture specialist conducted a field survey on 11 April 2023 to verify the current status of the environment. This survey enabled the specialist to determine whether any changes have occurred since the initial assessment and provide a statement supported by a site verification survey.

The results from the field survey confirm with the findings of the assessed EIA with regarding the dominant soil forms. Most areas where the amended layout will impact on the soil surface, consists of a combination of Mispah and Glenrosa soil. The agricultural potential assigned to these soil forms during the assessed EIA, also remains the same. The proposed amended layout of the Zen Wind Farm was evaluated and the new infrastructure layout will fall either on soils with High agricultural potential (according to the delineation by Van der Waals, 2012) or Medium agricultural potential. During the site visit, the landowner was applying soil amendments to maintain or improve the agricultural potential of the soils. The amended layout of the project's infrastructure will affect land with Medium and High agricultural sensitivity as can be seen in **Figure 2.7.** No areas with Very high sensitivity are affected by the infrastructure.

The site verification survey confirmed that the land use within the project site has remained the as in the assessed EIA. The dominant land use is still rainfed wheat production with cattle farming as secondary land use and old wheat stalks that remained in the fields after the previous harvest, were observed. There are centre pivot irrigated fields located east of the Klein Berg River and these pivots are mainly used for the production of pastures. All the infrastructure components of the amended layout is either located in the fields where wheat produced on the western side of the project site (west of the R44), or are access roads that already existed. No new access roads have been constructed within the project site.

Assessment of Amended Facility Layout

The impact rating provided in the assessed EIA remains valid and is still applicable. No additional impacts or change in impact significance will occur because of this amendment. No additional mitigation and management measures are required because of the proposed amendment to the facility layout.

The sensitivity analysis of the assessed EIA classified the Zen Wind Farm into three different categories of agricultural sensitivity which included Low, Medium and High. **Figure 2.7** shows the amended facility layout remains within the Medium and High sensitivity. The amended layout avoids all the Very High agricultural sensitivity areas. Turbines located within areas with soils of high sensitivity are considered acceptable for development (refer to allowable limits as discussed below). In addition, roads existing in this area, and can be readily used for accessing the planned turbine locations.

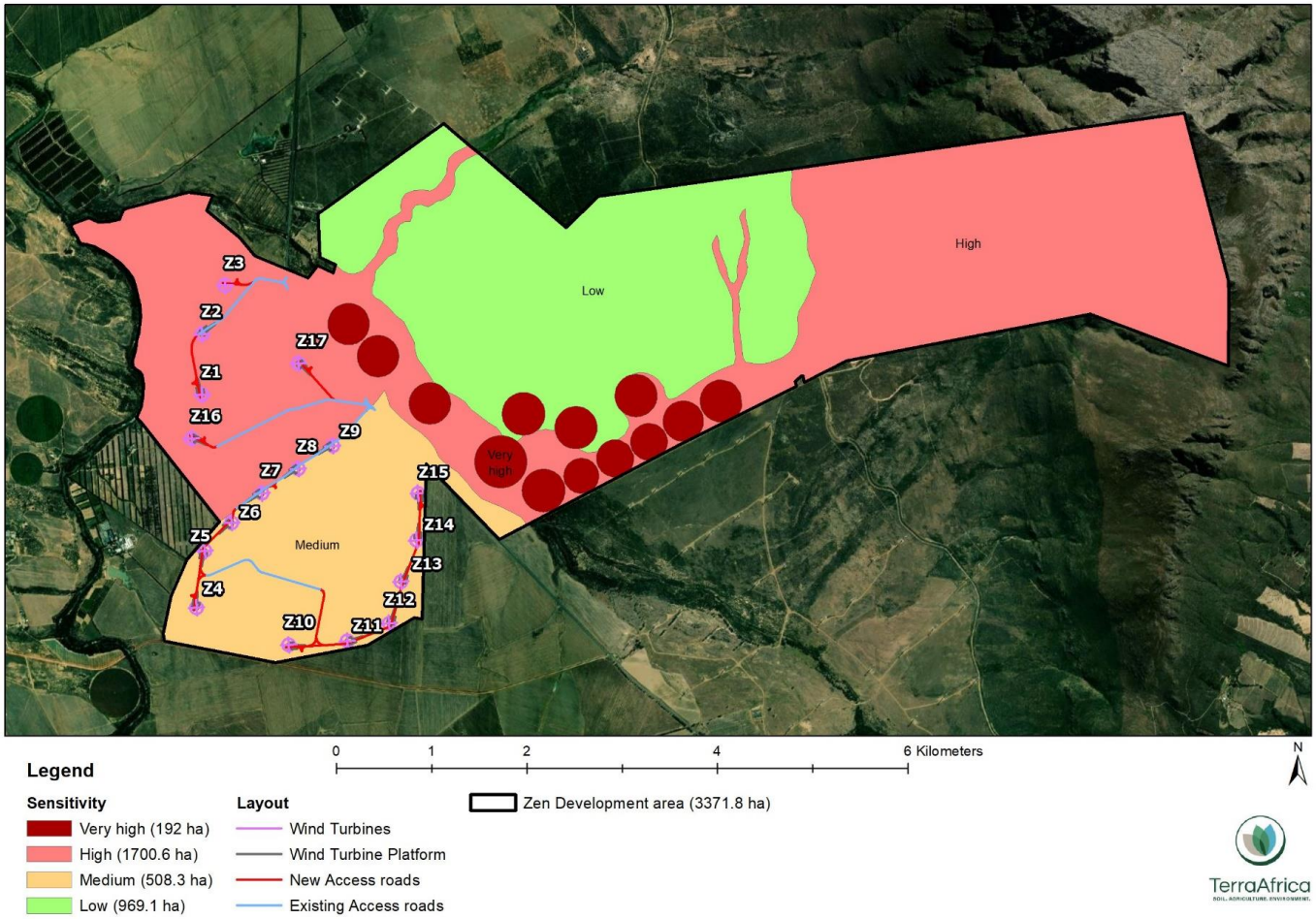


Figure 2.7: Amended layout for the Zen Wind Farm superimposed on the verified sensitivity

The verified sensitivity delineation of the surface footprint area differs from the agricultural sensitivity as provided by the screening tool. According to the screening tool, the largest part of the area consists of land with High agricultural sensitivity because of rainfed crop cultivation and Moderate-High (Class 09 and 10) land capability. The baseline information on soil and agricultural potential as discussed above, only partially agrees with this rating and indicates that the southern part of the site should rather be rated as Medium sensitivity.

Allowable development Limits

All infrastructure of the amended layout is located in crop fields with either High or Medium agricultural sensitivity. The surface footprint of the amended layout that must be considered for the allowable development limits, is 8.96ha. This consists of 17 wind turbines with each wind turbine platform about 400m^2, affecting a total area of 6800m^2. It includes for the permanent width (8m) of the 8785m new access roads (total area of 7.0ha) as well as widening of existing access roads from 6m to 8m (1.26ha) but excludes the temporary widening of the new and existing access roads to 10m as this will only be required during the construction phase.

The results of the calculations showed that the amended infrastructure layout is within the Allowable Development Limits for a project that generates 120MW of energy refer to **Table below.**

Table 5.8: Calculated allowable development limits for amended infrastructure layout of the Zen Wind Farm

Sensitivity class	Area that will be affected by development footprint (ha)	Allowable limit (ha/MW)	Area allowed for a 120 MW development (ha)	Area that exceeds allowable limit (ha)
Very High	0.00	0.00	0.00	0.00
High/Medium (within crop field boundaries)	8.96	0.20	22.40	0.00

Even if the construction phase footprint is considered, i.e., the temporary widening of both new and existing access roads with 2m (to reach a width of 10m) as well as the temporary facilities of 7.2ha, the project footprint is still within the allowable development limits, the total area affected during the construction phase will be 14.51ha.

Conclusion

The amended layout of the Zen Wind Farm is considered an acceptable change of the original layout, from the perspective of the project's impact on the agriculture resources of the area. The statement follows the consideration of the amended layout of Zen Wind Farm, as well as confirmation that all baseline conditions remained the same as during the original assessment. The baseline conditions remain unchanged since the original assessment and the infrastructure footprint still affects land with High and Medium agricultural sensitivity.

The impact rating, as provided in the original assessment, remains valid and the mitigation measures provided in the initial assessment are still applicable. During this assessment, the cumulative impacts as a result of this project as well as other similar projects in the area, were rated and mitigation measures provided. Apart from the mitigation and management measures for cumulative impacts, no additional mitigation and management measures are required to be included for the management of agricultural and soil impacts in the Environmental Management Programme (EMPr).

The amended layout to 17 turbines will have a reduced effect on the significance of impacts identified in the EIA report, as the surface footprint of the amended layout is smaller than the footprint of the original layout. In addition, the project development footprint is within the allowable development limits and meets the requirements of GNR 320 (not applicable at the time of the original assessment). The amended facility layout is supported.

In addition, the Specialist confirms the acceptability of the amended facility layout (for submission to and approval by DFFE), and that no additions/changes to the Environmental Management Programme (EMPr) are required.

» **Impacts on heritage (including Archaeology and Palaeontology)**

CTS Heritage, the Heritage specialist that conducted the original Environmental Impact Assessment (EIA), conducted a field survey on 19 April 2023 to verify the current status of the environment. This survey enabled the specialist to determine whether any changes have occurred since the initial assessment and provide a statement supported by a site verification survey.

Archaeology Walkdown

The Berg River alluvial terraces contain Early and Middle Stone Age artifacts, indicating human occupation for over a million years. However, the proposed development is not expected to directly impact these resources.

The presence of Early Stone Age artifacts varied across locations, and while they are generally considered to have little heritage conservation value, certain areas with high artifact densities may require mitigation if disturbed. Middle Stone Age artifacts were sparsely represented in the landscape. Two small Late Stone Age scatters were found on the banks of the Berg River.

The survey was conducted after the harvest, several scatters of early Middle Stone Age (MSA) artifacts were found throughout the study area. The majority of the artifacts were made from local quartzites sourced from the Klein Berg and Berg Rivers, with a smaller percentage made from quartz. These artifacts have undergone significant disturbance due to wheat cultivation and lack primary context. However, their presence contributes to the overall understanding of the distribution of these scatters in the area.

These findings align with the previous assessment conducted by CTS Heritage and Orton (2012) in terms of the types of tools identified. No engravings or graves were found within the development footprint, and the built structures consisted of modern cattle farming infrastructure, farm roads, jeep tracks, and fences.

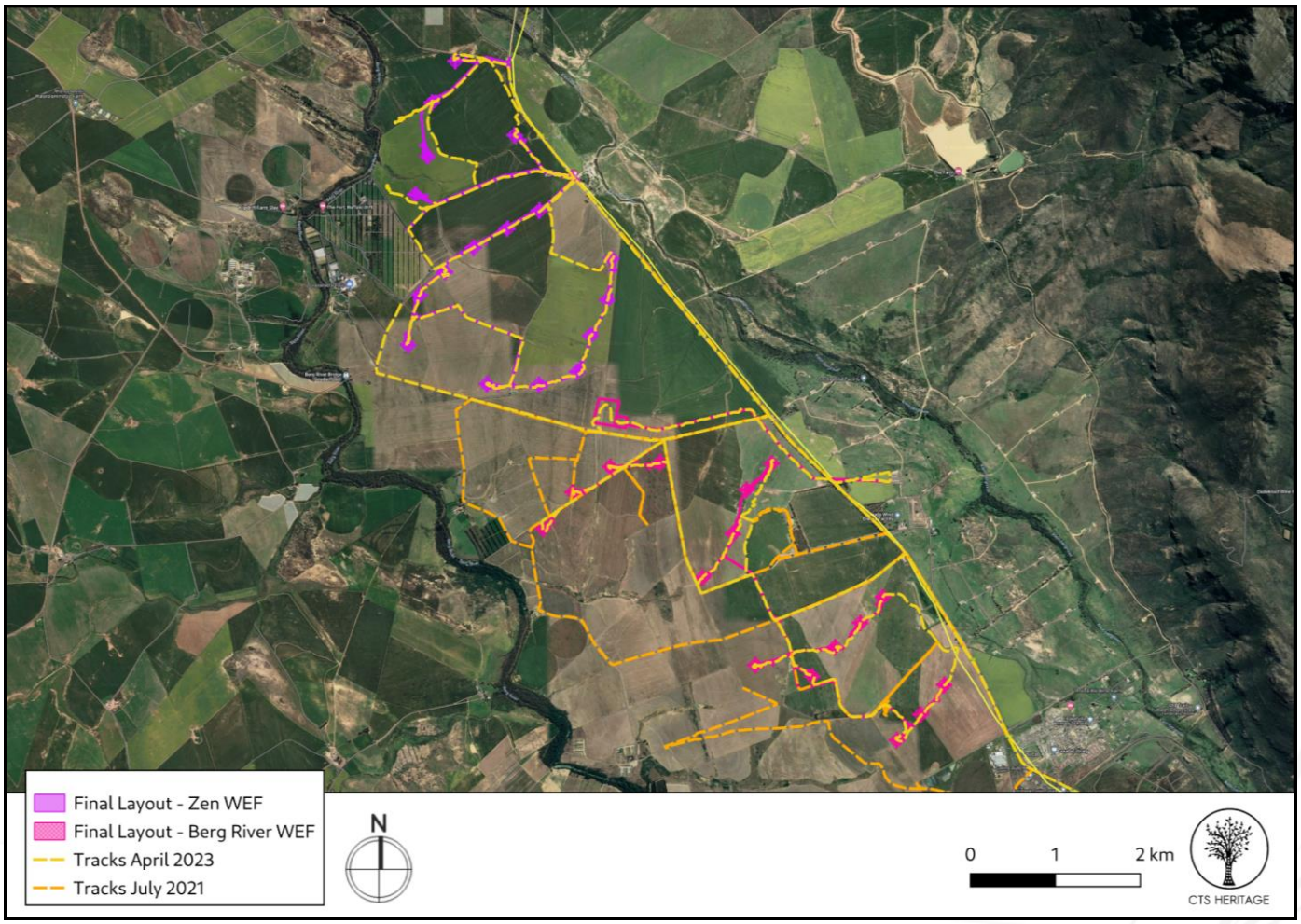


Figure 2.8: Overall track paths of foot survey from both 2021 (orange) and 2023 (yellow)

Table 5.8: Summary of observations noted during the field assessment completed in April 2023

POINT ID	Description	Type	Period	Density	Co-ordinates		Grading	Mitigation
001	Quartzite cobble core	Artefacts	MSA	0 to 5	-33.28475	19.010343	NCW	NA
002	Early MSA quartzite core, ~30% cortex	Artefacts	MSA	0 to 5	-33.284664	19.010927	NCW	NA
003	More Early MSA – core with several dorsal scars	Artefacts	MSA	0 to 5	-33.284544	19.011048	NCW	NA
004	Quartzite flake with hinge terminations	Artefacts	MSA	0 to 5	-33.284597	19.011295	NCW	NA
005	Quartzite radial core	Artefacts	MSA	0 to 5	-33.284787	19.012448	NCW	NA
006	Quartzite cores, flakes	Artefacts	MSA	5 to 10	-33.2849	19.014262	NCW	NA
007	Quartzite core	Artefacts	MSA	0 to 5	-33.283356	19.017041	NCW	NA
008	Early MSA quartzite flakes, cores	Artefacts	MSA	5 to 10	-33.285886	19.007322	NCW	NA
009	Quartzite cobble core with flake scars	Artefacts	MSA	0 to 5	-33.292512	19.023577	NCW	NA
010	Core, quartzite	Artefacts	MSA	0 to 5	-33.291392	19.026057	NCW	NA
011	Various quartzite flakes, prep. Platforms	Artefacts	MSA	5 to 10	-33.271187	19.002687	NCW	NA
012	Quartzite flake	Artefacts	MSA	0 to 5	-33.269405	19.004586	NCW	NA
013	Hammerstone and point, quartzite	Artefacts	MSA	0 to 5	-33.270259	19.003185	NCW	NA
014	Large silcrete core with several scars, partial radial core. Quartzite cores, flakes	Artefacts	MSA	5 to 10	-33.269452	19.004096	NCW	NA
015	Quartzite cores, flakes	Artefacts	MSA	5 to 10	-33.26805	19.005048	NCW	NA
016	Quartzite core	Artefacts	MSA	0 to 5	-33.267244	19.005452	NCW	NA
017	Quartzite cores, flakes	Artefacts	MSA	5 to 10	-33.265673	19.006568	NCW	NA
018	Quartzite flake, dorsal spine and hinge termination	Artefacts	MSA	0 to 5	-33.256998	18.971708	NCW	NA
019	Radial core, cores, flakes, quartzite	Artefacts	MSA	10 to 30	-33.235169	18.98188	NCW	NA
020	Quartzite cores and flakes in ploughed area	Artefacts	MSA	5 to 10	-33.246404	18.986436	NCW	NA
021	Quartzite cores	Artefacts	MSA	0 to 5	-33.238093	18.97879	NCW	NA
022	Flakes and cores, quartzite	Artefacts	MSA	5 to 10	-33.254991	18.982999	NCW	NA
023	Quartz flake, quartzite core	Artefacts	MSA	0 to 5	-33.245035	18.965898	NCW	NA
024	Quartzite cobbles and cores	Artefacts	MSA	5 to 10	-33.24061	18.973141	NCW	NA
025	Quartzite flakes	Artefacts	MSA	0 to 5	-33.237265	18.96093	NCW	NA

						2		
026	More Early MSA cobbles, cores, flakes	Artefacts	MSA	5 to 10	-33.237454	18.964205	NCW	NA
027	Quartzite flakes and cores	Artefacts	MSA	0 to 5	-33.228679	18.95989	NCW	NA
028	Quartzite core flakes, point	Artefacts	MSA	0 to 5	-33.222156	18.969463	NCW	NA
029	Quartzite core and flakes	Artefacts	MSA	5 to 10	-33.229726	18.974679	NCW	NA

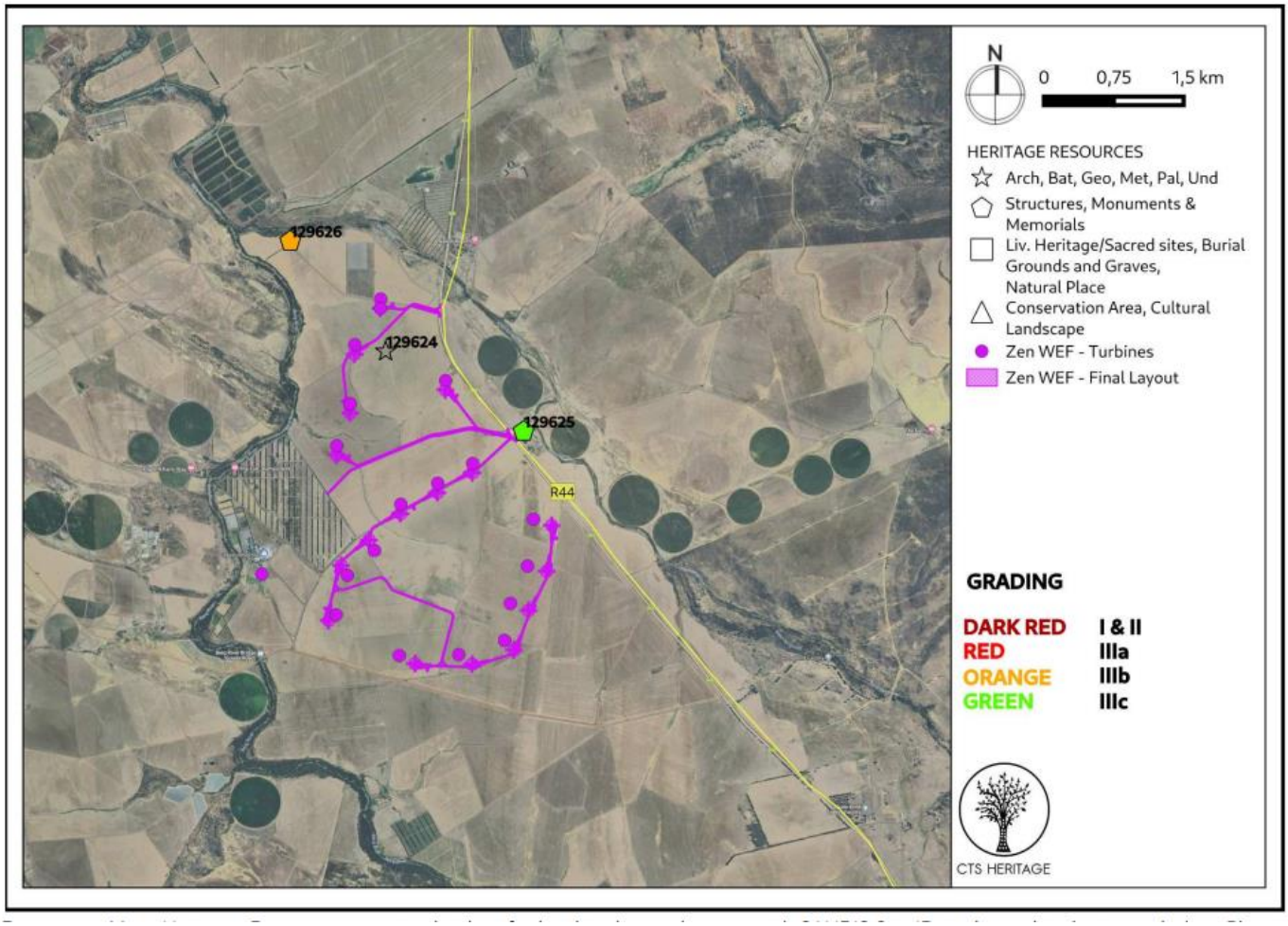


Figure 2.8: Map of heritage resources identified during the field assessment relative to the amended facility layout/s.

Assessment of Amended Facility Layout

The EIA indicated that the archaeological resources in the area are mainly of low significance and not conservation-worthy. The layout amendment is not expected to have a significant negative impact on these resources, and even if some Stone Age material is disturbed during construction, the overall impact is considered inconsequential. Therefore, the initial assessment's indication that the impact on archaeological heritage resources is low and inconsequential remains valid based on the new information from the recent surveys.

The initial assessment provided adequate mitigation measures which are likely to still be applicable, as the impact rating remains low. These measures include careful excavation and monitoring during construction to minimize any potential damage to archaeological resources, as well as guidelines for protecting any significant finds that might be encountered during the development process.

The field survey undertaken as part of the Archaeology walkdown indicated that the development area has a low to moderate sensitivity palaeontology impact based on the geological sediment as it was in the assessed EIA. There is no indication of significant palaeontological heritage resources in the area, and no further assessments are recommended.

The impact on cultural heritage, including historic settlements, scenic routes, and cultural landscapes, is expected to be negligible due to the development's location within an existing wind farm cluster with pre-existing electrical infrastructure. However, measures to minimize potential impacts on identified cultural heritage sites should still be considered in the assessed EIA. Therefore, the impact rating as provided in the initial assessment remains valid and mitigation measures provided in the initial assessment are still applicable.

The cumulative impacts resulting from this project and other similar projects in the surrounding environment have been considered, and the existing mitigation measures are deemed adequate to manage these impacts. It is unlikely that the amendment to the Zen Wind Farm layout will negatively impact archaeological resources, palaeontological resources or the cultural landscape of the broader Riebeeck Valley. As such, it is recommended that no further heritage assessments are required for this proposed amendment in terms of section 38 of the NHRA.

Overall, the impact rating of low significance and the existing mitigation measures can be reaffirmed based on the provided information. However, additional measures to handle any new discoveries should be included in the EMPr to ensure proper protection and documentation of any significant archaeological resources found during the development.

Conclusion

The amended facility layout for the Zen Wind Farm is considered an acceptable change from the perspective of the project's impact on the heritage and archaeological resources of the area. The original impact rating, which indicated low to moderate sensitivity for impacts on palaeontology and negligible impact on cultural heritage, remains valid. No additional mitigation and management measures are required to be included in the Environmental Management Programme (EMPr) regarding heritage and archaeological resources impacts.

The Specialist confirms the acceptability of the revised facility layout, which is intended for submission to and approval by DFFE.

» **Visual Impact**

LoGIS, the visual specialist that conducted the original Environmental Impact Assessment (EIA), verified the acceptability of the revised facility layout considering the current state of the environment. A field survey was not required, as the description of the affected environment, as described in the original VIA report remains unchanged. There has been no change in land use for the proposed development site, no new developments have been constructed on or near the development site, and the land use zonation (agriculture) remains the same.

Assessment of Amended Facility Layout

The proposed amendment to the project infrastructure is not expected to significantly alter the influence of the wind farm on *areas of higher viewer incidence* (observers traveling along the roads within the region) or *potential sensitive visual receptors* (residents of homesteads in closer proximity to the facility). No additional sensitive visual receptors are located within the area of increased visual exposure. The increased area of visual exposure does not include any additional exposure to major roads within the study area. The location of La Gratitude, Kleinbergrivier and La Bonne Esperance on properties earmarked for existing or potential wind energy facility developments reduces the probability of this impact occurring. The residents of Saron have not objected to the development of the wind energy facility, and the residential (built-up) nature of the town is expected to contain the visual impact to acceptable levels. It is therefore expected that the wind turbine structures, taking into consideration the reduction in the number of turbines, would be equally visible and noticeable from both the roads and homesteads.

This proposed amendment to the project infrastructure is not expected to significantly alter the influence of the WEF on *areas of higher viewer incidence* (observers traveling along the roads within the region) or *potential sensitive visual receptors* (residents of homesteads in closer proximity to the facility). Turbines will still be visible, albeit that there will be fewer turbines clustered to the west of the R44 road. The placement of all of the Zen Wind Farm turbines west of the R44 arterial road is preferred from a visual perspective.

The proposed amendment to the project infrastructure (turbine locations as well as the removal of the on-site facility substation) is consequently not expected to influence the anticipated visual impact, as stated in the original VIA report (i.e. the visual impact is expected to occur regardless of the amendment). This statement relates specifically to the assessment of the visual impact within a 5km radius of the wind turbine structures (potentially *high* significance), but also generally apply to potentially *moderate* to *low* visual impacts at distances of up to 30km from the structures.

From a visual perspective, the proposed amendment will therefore require no (zero) changes to the significance rating within the original visual impact assessment report that was used to inform the approved EIA. In addition to this, no new mitigation measures are required.

There are no new assessment guidelines which are now relevant to the authorised development which were not undertaken as part of the initial visual impact assessment. Additional to this, and as stated above, there have been no changes to the environment of the proposed development site or the surrounding environment.

Cumulative visual impact

The Zen Wind Farm is located immediately north-west of the operational Gouda Wind Farm (an existing visual disturbance). The close proximity of these two wind farms to each other is considered to consolidate and concentrate the wind energy generation infrastructure within this locality, as opposed to scattering it throughout the region (i.e. if they were placed beyond a 5km radius of each other). The placement of all of the Zen Wind Farm turbines west of the R44 arterial road is also preferred and the cumulative visual impact is deemed to be of an acceptable level.

Notwithstanding this statement, this landscape (based on the scenic nature of the receiving environment, the presence of declared scenic mountain ranges, proclaimed protected areas, and the number of potentially affected sensitive visual receptors located within the study area), has fast approached its

capacity or threshold to accommodate wind energy infrastructure (in terms of visual quality and landscape character of the area). This statement considers and takes into account the wind turbines from the existing Gouda Wind Farm, as well as the potential future wind turbine structures associated with the Zen Wind Farm and the Zen Wind Farm. Cumulative visual impacts are assessed as acceptable, but the construction of any additional Wind Farms may exacerbate the potential for significant impact.

Conclusion

The proposed amendment will require no changes to the impact significance ratings as stated within the original VIA report which was used to inform the approved EIA. The amended layout is supported. In addition to this, no new mitigation measures are required.

The Specialist confirms the acceptability of the amended facility layout (for submission to and approval by DFFE), and that no additions/changes to the Environmental Management Programme (EMPr) are required.

» **Noise impact**

M2 Environmental Connections cc now known as Enviro Acoustic Research, the Noise specialist that conducted the original Environmental Impact Assessment (EIA), was appointed to verify the current status of the environment. Field survey was not required as the description of the affected environment, as described in the original VIA report remains unchanged.

There is a low significance rating for a cumulative noise impact to occur during the operational phase (the same finding as the per the 2022 noise assessment). The impact rating as provided in the initial assessment remains valid as well the mitigation measures provided in the assessed EIA are still applicable.

Assessment of the Amended Facility Layout

The overall impact rating provided in the assessed EIA remains valid and is still applicable. No additional impacts or change in impact significance will occur because of this amendment.

The significance of the noise impact will be of a low significance for both daytime and nighttime construction activities and additional mitigation measures are not required or recommended. However, night-time construction activities may generate noises at a sufficient level to be annoying to some NSR and this assessment include recommendations that may reduce annoyance with night-time construction activities.

The noise report considers the potential noise impact on the surrounding environment due to the construction, operational and future decommissioning activities associated with the Project. It makes use of conceptual scenarios to develop noise propagation models to estimate potential noise levels. Considering the ambient sound levels measured onsite, the proposed noise limits as well as the calculated noise levels, it was determined that the significance of the potential noise impacts would be:

» of a low significance for the construction of access roads. The potential impact associated with the construction of the access road was not was not previously assessed as the road layout was not available;
» of a low significance relating to noises from construction traffic. The potential impact associated with construction traffic passing NSR was not previously assessed as the road layout was not available;

- » of a low significance for the daytime construction activities (hard standing areas, excavation and concreting of foundations and the assembly of the WTG and other infrastructure). This is the same finding as the per the 2019 comparative noise assessment;
- » of a potential low significance for the night-time construction activities (the potential pouring of concrete, erection of WTG). Night-time construction activities were not specifically assessed in the 2019 comparative assessment;
- » of a low significance for daytime operational activities (noises from wind turbines) when considering the worst-case SPL. Night-time construction activities were not specifically assessed in the 2019 comparative assessment; and
- » of a medium significance for night-time operational activities (noises from wind turbines) when considering the worst-case SPL. This is a higher significance than the low significance determined in the 2019 comparative noise assessment, with the significance mainly relating to the use of a WTG with a higher SPL. Mitigation is available to reduce the noise level as well as the potential significance of the noise impact.

The EMPr for the Zen Wind Farm sufficiently captures the mitigation and post-construction monitoring requirements for impacts from noise. The following amendment to the Zen Wind Farm the following EMPr are recommended:

- » The applicant re-evaluate the noise impact should the layout be further revised where:
  - o any WTG, located within 1,500 m from a confirmed NSR, are moved closer to the NSR;
  - o the number of WTG within 2,000m from an NSR are increased.
  - o if the final make and model of the WTG is different from the WTG assessed in this report
- » Design and implement a noise monitoring program, measuring ambient sound levels before construction activities start, as well as during the operational phase (recommended at NSR01/02/03, NSR 17/18, NSR26/28, NSR04, NSR05/06 and NSR14);
- » Ensure that mobile heavy equipment is well maintained and fitted with the correct and appropriate noise abatement measures. Engine bay covers over heavy equipment could be pre-fitted with sound absorbing material. Heavy equipment that fully encloses the engine bay should be considered, ensuring that the seam gap between the hood and vehicle body is minimised;
- » Include a component covering environmental noise in the Health and Safety Induction to sensitize all employees and contractors about the potential impact from noise, especially those employees and contractors that have to travel past receptors at night, or might be required to do work close (within 1,000m) to NSR at night. This should include issues such as minimising the use of vehicle horns;
- » Investigate any reasonable and valid noise complaint if registered by a receptor staying within 2,000 m from the location where construction activities are taking place, or where night-time construction activities are required, or where an operational WTG are located. A complaint register, keeping a full record of the complaint, must be kept by the applicant;
- » With regard to unavoidable noisy night-time construction activities in the vicinity of NSR (closer than 1,000m from any identified NSR), the contractor and Environmental Control Officer (ECO) must liaise with local NSR on how best to minimise impact and the NSR must be kept informed of the nature and duration of intended activities; and 8. where practicable, mobile equipment should be fitted with broadband (white-noise generators/alarms 34 35), rather than tonal reverse alarms.

Cumulative noise impact

NSR14 and NSR116 are located between the WTG of the proposed Zen Wind Farm and Bergrivier Wind Farm, and there is a cumulative impact at these NSR. Total cumulative noise levels however will be well less than 45 dBA at these NSR and of a low concern.

Noises from other wind farms within 35 km will have an insignificant influence on the noise levels at the NSR.

Conclusion

Active noise monitoring is recommended because the projected noise levels are more than 38.7 dBA (the level defined by the WHO where noise levels from WTG may become annoying) for the layout and WTG as assessed in this report. Noise levels may be higher than 45 dBA at certain NSR for a WTG with an SPL similar to the Nordex N163/5.X (109.2 dBA re 1 pW).

From an acoustic perspective the reduction in turbine numbers and the amended facility layout is acceptable subject that the applicant implements mitigation measures to ensure total noise levels less than 45 dBA at NSR used for residential purposes. It is recommended that the changes to the Zen Wind Farm facility layout be authorised. Additional mitigation measures are included in this comparative assessment (compared to the 2019 noise report), due to the change in layout as well as the use of a WTG with a higher SPL.

The amended facility layout for the Zen Wind Farm is considered suitable for development. The Specialist confirms the acceptability of the revised facility layout, which is intended for submission to and approval by DFFE. An amendment to measures for avoiding, managing, and mitigating impacts resulting from the proposed changes, and the additions/changes to the Environmental Management Programme (EMPr) have been provided.

» **Socio-economic**

Tony Barbour was the specialist for the original SIA (Social Impact Assessment) for the Zen Wind Farm and also verified the current status of the environment. A field survey was not required as the project area has not changed since the EIA (Environmental Impact Assessment) was undertaken. This statement confirms the status of the environment compared to that at the time of the original assessment.

Assessment of the Amended Facility Layout

There are no changes to the significance ratings reflected in the SIA undertaken by Social Impact Assessors 2013 as a result of the change to the facility layout. In this regard the:

» The social issues identified and associated impact ratings for the construction and operational phase contained in the 2013 SIA (Barbour and van der Merwe 2013) remain valid for the Zen Wind Farm. The associated mitigation measures remain applicable.
» The mitigation and enhancement measures listed in the 2013 SIA (Barbour and van der Merwe 2013) remain valid for the Zen Wind Farm. No additional management outcomes or mitigation measures in terms of social impacts are therefore required.

The findings of the SIA undertaken by Social Impact Assessors in 2013 and associated enhancement and mitigation measures therefore remain valid.

Conclusion

Based on the experience of the author the findings of the SIA undertaken in 2013 remain valid for the reduced number of wind turbines and the change to the facility layout. The enhancement and mitigation measures listed in the 2013 SIA also remain valid. The application for the Zen Wind Farm, including the reduction and reposition of turbines, is acceptable and supported from a social and socio-economic perspective.

The conclusion drawn by the specialist is that the environment has not significantly changed since the undertaking of the EIA, and it can be concluded that the proposed amendments will not lead to any additional impacts other than those identified and assessed within the EIA. The amendments will not increase the significance of the impacts originally identified and assessed in the EIA or lead to any additional impacts that cannot be mitigated to a low significance following the implementation of the recommended mitigation measures. The mitigation measures recommended in the EIA are adequate to manage the expected impacts as a result of the proposed amendments. No additional mitigation measures are recommended as a result of the proposed amendments.

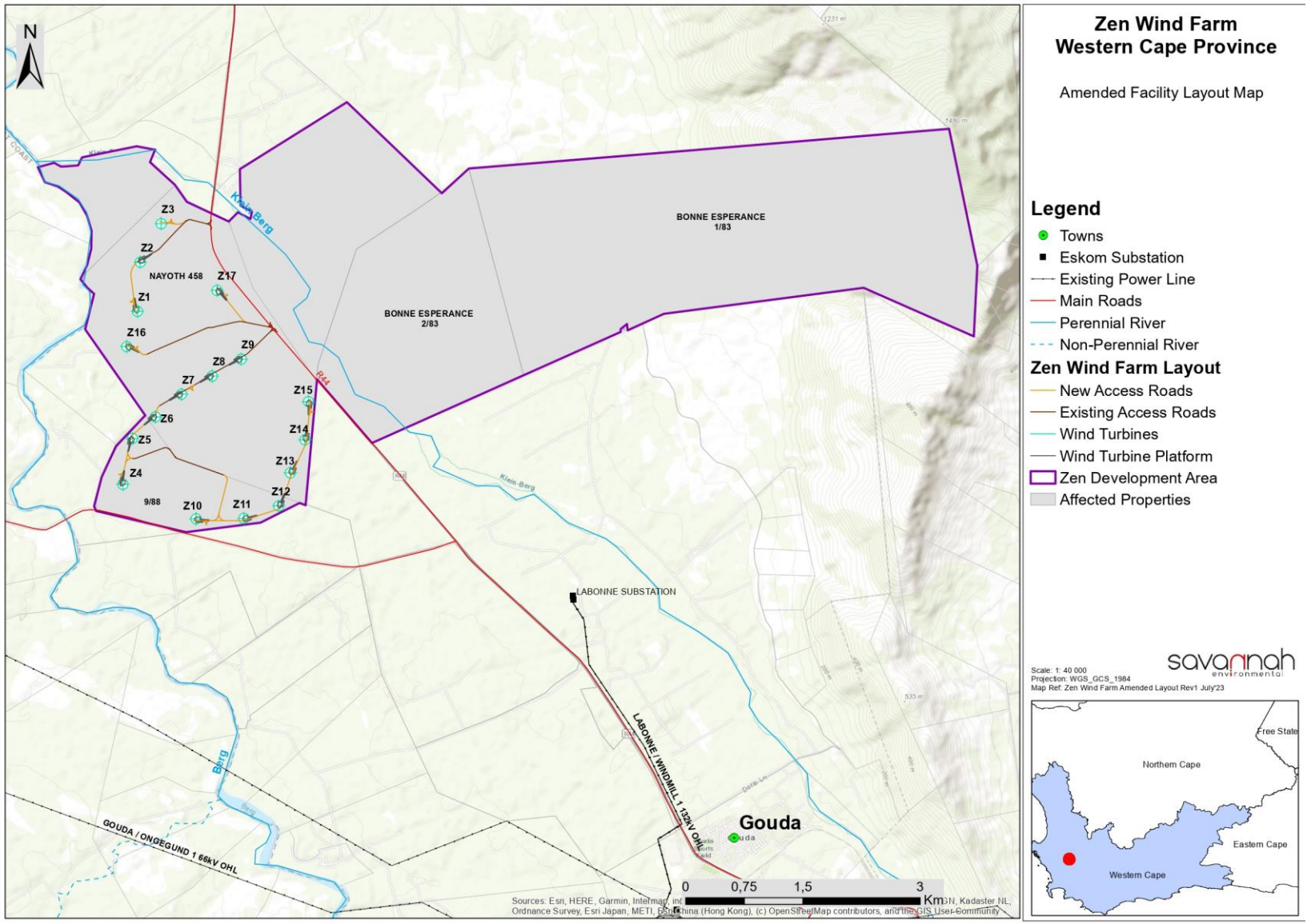


Figure 2.9: Amended Facility Layout Map for the Zen Wind Farm, including all identified and verified environmental sensitivities ((map ref: Zen Wind Farm Amended Layout Rev2 Jul'23 also included in Appendix A) Zen wind Farm Amendment Layout (Map ref: Zen Wind Farm EIA Layout Rev2)

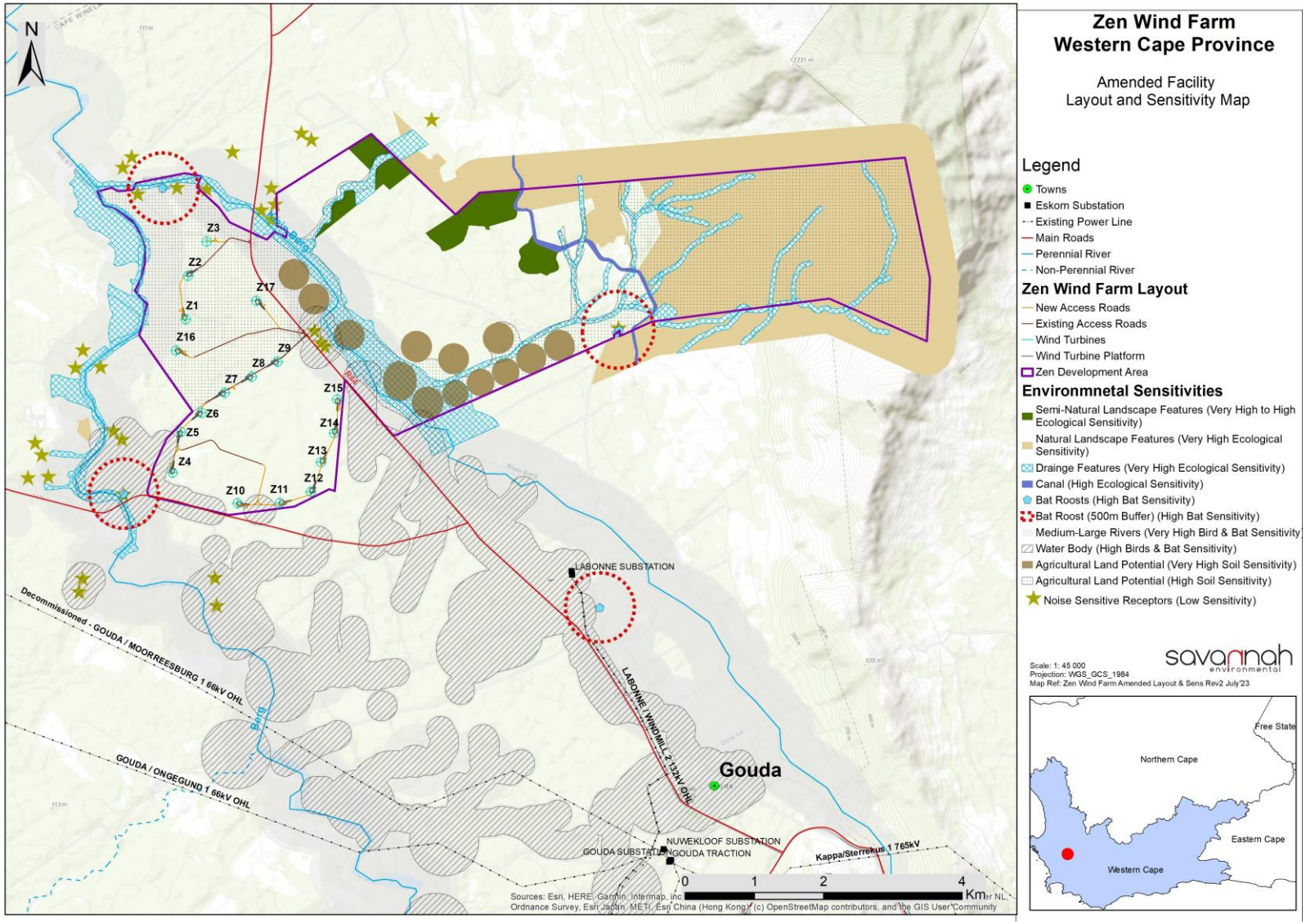


Figure 2.10: Amended Facility Layout Map for the Zen Wind Farm, including all identified and verified environmental sensitivities (map ref: Zen Wind Farm Amended Layout & Sens Rev2 Jul'23 also included in **Appendix A**)

2.3. Activities and Components associated with the Facility

Table 1.1: Activities Associated with Planning, Construction, Operation and Decommissioning of the Facility

Main Activity/Project Component	Components of Activity	Details
	Planning	
Conduct technical surveys	» Negotiation for the power line servitude » Geotechnical survey by geotechnical engineer; » Site survey and confirmation of the infrastructure micro-siting footprint; ~~» Survey of substation site; and~~ » ~~Survey of power line servitudes to determine tower locations.~~	» All surveys are to be undertaken prior to initiating construction.
	Construction	
Conduct technical surveys	» Geotechnical survey by geotechnical engineer; » Site survey and confirmation of the infrastructure micro-siting footprint; ~~» Survey of substation sites; and~~ ~~» Survey of power line servitudes to determine tower locations.~~	» All surveys are to be undertaken prior to initiating construction.
Establishment of access roads and/ bridge.	» Upgrade access/haul roads to the site, as required (this only refers to the main access roads leading directly to site itself). » Temporary access roads will be up to 10m wide in some places due to turning circles that are required. » Establish internal access roads: up to 8m wide permanent roadway within the site between the turbines for use during construction and operation phase. » Temporary track of 11m for use during construction phase only.	» The Zen site is currently accessible from the R44. » Existing access roads will be utilised and upgraded. » A bridge to cross the Klein Berg river may have to be built. » Access roads will be constructed/upgraded in advance of any components being delivered to site, and will remain in place after completion for future access and possibly access for replacement of parts if necessary. » Existing access roads to the site will be utilised, and upgraded where required. Special haul roads may need to be constructed to and within the site to accommodate abnormally loaded vehicle access and circulation. » The internal service road alignment is informed by the final micro-siting/positioning of the wind turbines (as well as specialist surveys). To

Main Activity/Project Component	Components of Activity	Details
		accommodate the large crawler crane required for turbine assembly, a track of up to 11 m in width is required to be established on the site (as advised to be required by the developer).
Undertake site preparation	» Site establishment of offices / workshop with ablutions and stores and contractors' yards. » Establishment of internal access roads (permanent and temporary roads) » Clearance of vegetation at the footprint of each turbine » Excavations for foundations	» These activities will require the stripping of topsoil, which will need to be appropriately stockpiled for use in rehabilitation.
Establishment of laydown areas on site	» Laydown areas at each turbine position for the storage of wind turbine components and accommodation of construction and crane lifting equipment. » Temporary lay down area for crane assembly.	» Each turbine needs a flat and hardened lay down area of ~2400 m^2 during the construction process. » This area can be rehabilitated after construction. » The lay down area will need to accommodate the cranes required in tower/turbine assembly. Lay down and storage areas will be required to be established for the normal civil engineering construction equipment which will be required on site. A large lay down area will be required at each position where the main lifting crawler crane may be required to be erected and/or disassembled. This area would be required to be compacted and levelled to accommodate the assembly crane, which would need to access the crawler crane from all sides. » Such areas to make use of already compacted areas as far as possible, such as roadways or other laydown areas.
Construct wind turbine foundations	» Concrete foundations of approximately of up to 20 m x 20 m x 4 m depth at each turbine location (final dimensions to be defined by geotechnical survey of the site).	» Foundation holes will be mechanically excavated. » Shoring and safety barriers will be erected. » Aggregate and cement to be transported from the closest centre to the development, with the establishment of a small concrete batching plant close to the activities. » Concrete may to be brought to site as ready-mix or batched on site if no suitable concrete suppliers are available in the vicinity. The reinforced concrete foundation will be poured and will support a

Main Activity/Project Component	Components of Activity	Details
		mounting ring. The foundation will then be left up to a week to cure.
Transport of components and equipment to site	» Flatbed trucks will be used to transport the majority of components to site from the nearest port (Cape Town). * Turbine units consist of a tower comprised of 4 segments, a nacelle, and three rotor blades. * Components of various specialised construction, lifting equipment and counter weights etc. are required on site (e.g. mobile assembly crane and main lift crawler crane) to erect the wind turbines. * The normal civil engineering construction equipment for the civil works (e.g. excavators, trucks, graders, compaction equipment etc.). ~~* The components required for the establishment of the substations (including transformers)~~ ~~* Components required for the establishment of the power line (including towers and cabling)~~ * Ready-mix cement trucks for turbine ~~and substation~~ foundations	» Turbine units consist of a tower comprised of 4 segments, a nacelle, and three rotor blades. Components of various specialised construction, lifting equipment and counter weights etc. are required on site (e.g. 200 ton mobile assembly crane and a 750 ton main lift crawler crane) to erect the wind turbines. ~~Other components include components required for the establishment of the substations (including transformers) and those required for the establishment of the power line (including towers and cabling).~~ » The wind turbine, including tower, will be brought to site by the supplier in sections. The individual components are defined as abnormal loads in terms of the Road Traffic Act (Act No 29 of 1989) by virtue of the dimensional limitations (abnormal length of the blades) and load limitations (i.e. the nacelle). The dimensional requirements of the load during the construction phase (length/height) may require alterations to the existing road infrastructure (widening on corners, removal of traffic islands), accommodation of street furniture (electricity, street lighting, traffic signals, telephone lines etc.), and protection of road-related structures (bridges, culverts, portal culverts, retaining walls etc.) as a result of abnormal loading. The equipment will be transported to the site using appropriate National and Provincial routes, and the dedicated access/haul road to the site itself.
Erect turbines	» Large lifting crane used for lifting of large, heavy components » A crane for the assembly of the rotor	» The large lifting crane will lift the tower sections into place. » The nacelle, which contains the gearbox, generator, and yawing mechanism, will then be placed onto the top of the assembled tower. » The rotor (i.e. the blades of the turbine) will then be assembled or partially assembled on the ground. It will then be lifted to the nacelle and bolted in place. » It will take approximately 2 days to erect each turbine, although this

Main Activity/Project Component	Components of Activity	Details
		will depend on the climatic conditions as a relatively wind-free day will be required for the installation of the rotor.
~~Construct substations and associated ancillary infrastructure.~~	~~» Substations and associated components;~~ ~~» Security fencing around high voltage (HV) yard; and~~ ~~» An operations and maintenance building, including a workshop building, is proposed. Some of the existing on-site buildings may be utilised where practical.~~	~~» A temporary construction area is needed for containers, toilets, and equipment.~~ ~~» Permanent operational buildings are as follows:~~ ~~* Operations and maintenance facility, including a storage building (100m x 100m m), will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to construction.~~ ~~» A laydown area for building materials and equipment associated with these buildings will also be required.~~ ~~» The on-site substation will be constructed with a HV yard footprint of up to 200 m x 200 m.~~ ~~» The substation would be constructed as follows:~~ ~~* Step 1: Survey of the site~~ ~~* Step 2: Site clearing and levelling and construction of access road to substation site~~ ~~* Step 3: Construction of terrace and foundations~~ ~~* Step 4: Assembly, erection and installation of equipment (including transformers)~~ ~~* Step 5: Connection of conductors to equipment~~ ~~* Step 6: Rehabilitation of any disturbed areas and protection of erosion sensitive areas.~~
Connection of the wind turbines to the on-site/adjacent substation	» Wind turbines » 33kV underground (where practical) electrical cabling connecting each turbine to the substation	» The installation of these cables will require the excavation of trenches, approximately 1m in depth within which these cables can then be laid. The underground cables would follow the internal access roads as far as reasonably possible.
~~Connect substations to power grid~~	~~» A new 132kV overhead power line feeding into the power grid at the new LeBonne Substation.~~	~~» The route for the power line will be assessed, surveyed, and pegged prior to construction.~~ ~~» A servitude of approximately 36 m will be required for the power line.~~
Commissioning of the facility	» Start up for electricity generation	» Prior to the start-up of a wind turbine, a series of checks and tests will be carried out, including both static and dynamic tests to make sure the turbine is working within appropriate limits.

Main Activity/Project Component	Components of Activity	Details
		» Grid interconnection and unit synchronisation will be undertaken to confirm the turbine performance. Physical adjustments may be needed such as changing the pitch of the blades of the turbines.
Undertake site remediation	» Remove all construction equipment from the site. » Rehabilitation of temporarily disturbed areas where practical and reasonable.	» On full commissioning of the facility, any access points to the site which are not required during the operation phase will be closed and prepared for rehabilitation.
Operation		
Operation	» Operation of the wind turbines	» Once operational, the Wind Farm will be monitored. » It is anticipated that there will be full time security, maintenance and control room staff required on site. » Each turbine in the facility will be operational, except under circumstances of mechanical breakdown, extreme weather conditions, or maintenance activities.
Maintenance	Maintenance activities include: » Oil and grease – turbines; ~~» Transformer oil – substation; and~~ » Waste product disposal » Cleaning of turbines	» The wind turbines will be subject to periodic maintenance and inspection. » Periodic oil changes will be required and any waste products (e.g. oil) will be disposed of in accordance with relevant waste management legislation. » The turbine infrastructure is expected to have a lifespan of approximately 25 - 30 years, with maintenance.
Decommissioning		
Site preparation	» Confirming the integrity of the access to the site to accommodate required equipment and lifting cranes. » Preparation of the site (e.g. lay down areas, construction platform) » Mobilisation of construction equipment	» Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life. It is most likely that decommissioning activities of the infrastructure of the facility would comprise the disassembly and replacement of the turbines with more appropriate technology/infrastructure available at that time.
Disassemble wind turbines	» A large crane will be used to disassemble the turbine and tower sections. » The turbines will be disassembled and	» Turbine components would be reused, recycled, or disposed of in accordance with regulatory requirements.

Main Activity/Project Component	Components of Activity	Details
	removed.	

3 PURPOSE AND OBJECTIVES OF THE EMPr

An Environmental Management Programme (EMPr) is defined as "an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented or mitigated, and that the positive benefits of the projects are enhanced"[4]. The objective of this EMPr is to provide consistent information and guidance for implementing the management and monitoring measures established in the permitting process and help achieve environmental policy goals. The purpose of an EMPr is to help ensure continuous improvement of environmental performance, reducing negative impacts and enhancing positive effects during the construction and operation of the facility. An effective EMPr is concerned with both the immediate outcome as well as the long-term impacts of the project.

The EMPr provides specific environmental guidance for the construction and operation phases of a project, and is intended to manage and mitigate construction and operation activities so that unnecessary or preventable environmental impacts do not result. These impacts range from those incurred during start up (site clearing and site establishment) through those incurred during the construction activities themselves (erosion, noise, dust) to those incurred during site remediation (soil stabilisation, revegetation) and operation.

The EMPr has been developed as a set of environmental specifications (i.e. principles of environmental management for the proposed Zen Wind Farm), which are appropriately contextualised to provide clear guidance in terms of the on-site implementation of these specifications (i.e. on-site contextualisation is provided through the inclusion of various monitoring and implementation tools for assisted use of the EMPr by the project implementer as well as compliance monitors). The EMPr is separated into measures dealing with the various project phases.

The EMPr has the following objectives:

- To outline mitigation measures and environmental specifications which are required to be implemented for the planning, construction, rehabilitation and operation phases of the project in order to minimise the extent of environmental impacts, and to manage environmental impacts associated with the wind energy facility.
- To ensure that the construction and operation phases do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced.
- To identify entities who will be responsible for the implementation of the measures and outline functions and responsibilities.
- To propose mechanisms and frequency for monitoring compliance, and preventing long-term or permanent environmental degradation.
- To facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that was not considered in the EIA process.

The mitigation measures identified within the EIA process are systematically addressed in the EMPr, ensuring the minimisation of adverse environmental impacts to an acceptable level.

[4] Provincial Government Western Cape, Department of Environmental Affairs and Development Planning: *Guideline for Environmental Management Plans*. 2005

FE Bonne Esperance (Pty) Ltd must ensure that the implementation of the project complies with the requirements of all environmental authorisations, permits, and obligations emanating from relevant environmental legislation. This obligation is partly met through the development and the implementation of this EMPr, and through its integration into the relevant contract documentation provided to parties responsible for construction and/or operation activities on the site. The adequacy and efficacy of implementation is to be monitored by an independent Environmental Control Officer (ECO). It is important that this document be read in conjunction with the Final EIA report, and any subsequent assessments compiled for this project. This will contextualise the EMPr and enable a thorough understanding of its role and purpose in the integrated environmental management process. Should there be a conflict of interpretation between this EMPr and the Environmental Authorisation, the stipulations in the Environmental Authorisation shall prevail over that of the EMPr, unless otherwise agreed by the authorities in writing. Similarly, any provisions in legislation overrule any provisions or interpretations within this EMPr.

This EMPr shall be binding on all the parties involved in the construction and operational phases of the project and shall be enforceable at all levels of contract and operational management within the project. The document will be adhered to, updated as relevant throughout the project life cycle.

To achieve effective environmental management, it is important that Contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMPr. The Contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The Contractor's obligations in this regard include the following:

- Ensuring that employees have a basic understanding of the key environmental features of the construction site and the surrounding environment.
- Ensuring that a copy of the EMPr is readily available on-site, and that all site staff are aware of the location and have access to the document. Employees will be familiar with the requirements of the EMP and the environmental specifications as they apply to the construction of the facility.
- Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training course. The course must provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
- Providing basic training in the identification of archaeological sites/objects, and protected flora and fauna that may be encountered on the site.
- Ensuring awareness of any other environmental matters, which are deemed necessary by the Environmental Control Officer (ECO).

The EMPr is a dynamic document, which must be updated when required. It is considered critical that this draft EMPr be updated to include site-specific information and specifications as required throughout the life-cycle of the facility. This will ensure that the project activities are planned and implemented in terms of Best Environmental Practice.

4 STRUCTURE OF THIS EMPR

The first three chapters provide background to the EMPr and the Zen Wind Farm. The chapters which follow consider the:

» Planning and design activities
» Construction activities
» Operation activities
» Decommissioning activities

These chapters set out the procedures necessary for the FE Bonne Esperance (Pty) Ltd to achieve environmental compliance. For each of the phases of implementation for the renewable energy facility project, an over-arching environmental **goal** is stated. In order to meet this goal, a number of **objectives** are listed. The management programme has been structured in table format in order to show the links between the goals for each phase and their associated objectives, activities/risk sources, mitigation actions monitoring requirements and performance indicators. A specific environmental management programme table has been established for each environmental objective. The information provided within the EMPr table for each objective is illustrated below:

OBJECTIVE: Description of the objective, which is necessary in order to meet the overall goals; these take into account the findings of the environmental impact assessment specialist studies

Project component/s	List of project components affecting the objective, i.e.: » Wind turbines » Access roads » ~~Substations~~ » ~~Power lines~~
Potential Impact	Brief description of potential environmental impact if objective is not met
Activity/risk source	Description of activities which could impact on achieving objective
Mitigation: Target/Objective	Description of the target; include quantitative measures and/or dates of completion

Mitigation: Action/control	**Responsibility**	**Timeframe**
List specific action(s) required to meet the mitigation target/objective described above.	Who is responsible for the measures	Time periods for implementation of measures

Performance Indicator	Description of key indicator(s) that track progress/indicate the effectiveness of the management plan.
Monitoring	Mechanisms for monitoring compliance; the key monitoring actions required to check whether the objectives are being achieved, taking into consideration responsibility, frequency, methods and reporting

The objectives and EMPr tables are required to be reviewed and possibly modified whenever changes, such as the following, occur:

» Planned activities change (i.e. in terms of the components and/or layout of the facility).
» Modification to or addition to environmental objectives and targets.
» Relevant legal or other requirements are changed or introduced.
» Significant progress has been made on achieving an objective or target such that it should be re-examined to determine if it is still relevant, should be modified, etc.

3.1. Project Team

This EMPr was compiled by:

	Name & Surname	Company
EMPr Compilers:	Ravisha Ajodhapersadh	Savannah Environmental
	Karen Jodas	Savannah Environmental
	Candy Mahlangu	Savannah Environmental
Specialists:	Simon Todd	Simon Todd Consulting
	Tony Williams	African Insights
	Bárbara Monteiro and Ricardo Ramalho	Bio3
	Jayson Orton	ACO Associates
	Morne de Jager	M2 Environmental Connections CC
	Lourens du Plessis	MetroGIS
	Tony Barbour	Tony Barbour Environmental Consulting and Research
	Johan van Der Waals	Terra SoilScience
	John Almond	Natura Viva
	Jenna Lavin and Sarah Winter	CTS Heritage
	Brian Colloty	EnviroSci (Pty) Ltd
	Sam Laurence, Luke Verburgt, and Corne Niemand	Enviro-Insight

The Savannah Environmental team have extensive knowledge and experience in environmental impact assessment and environmental management, having been involved in EIA processes for more than seventeen (17) years. They have managed and drafted Environmental Management Programmes for other power generation projects throughout South Africa, including numerous wind and solar energy facilities.

The EAPs from Savannah Environmental who are responsible for this project are:

» Karen Jodas is a Director at Savannah Environmental (Pty) Ltd and the project manager for the Harmony Gold projects, she holds a Master of Science Degree and is registered as a Professional Natural Scientist with the South African Council for Natural Scientific Professions (SACNASP) and a registered EAP with EAPASA. She has gained extensive knowledge and experience on potential environmental impacts associated with electricity generation and transmission projects through her involvement in related EIA processes over the past 25 years. She has successfully managed and undertaken EIA processes for infrastructure development projects throughout South Africa. Responsibilities for environmental studies include project management (including client and authority liaison and management of specialist teams); review and manipulation of data; identification and

assessment of potential negative environmental impacts and benefits; review of specialist studies; and the identification of mitigation measures.

» *Ravisha Ajodhapersadh*– the principle author of this report holds an Honours Bachelor of Science degree in Environmental Management and has 6 years' experience in environmental management and EIA.

» Candy holds a Bachelor of Arts degree in Environmental Management and is experienced in executing professionally consulting services for various projects in the environmental management field. She specialises in conducting Environmental Impacts Assessments, public participation processes, compiling Environmental Management Programmes, for residential developments, commercial developments, industrial upgrades, bulk services, and renewable energy projects. Her main responsibilities include conducting public participation, overall compilation of the Basic Assessments and EIA report, specialists' engagements, reviewing specialists reports and incorporating specialist studies into the Environmental Impact Assessment reports and the associated Environmental Management Programmes.

5 MANAGEMENT PROGRAMME FOR THE WIND ENERGY FACILITY: PLANNING & DESIGN

4.1. Goal for Planning and Design

Overall Goal for Planning and Design: Undertake the planning and design phase of the Zen Wind Farm in a way that:

» Ensures that the design of the facility responds to the identified environmental constraints and opportunities.
» Ensures that adequate regard has been taken of any landowner concerns and that these are appropriately addressed through design and planning (where appropriate).
» Ensures that the best environmental options are selected for the project.
» Enables the wind energy facility construction activities to be undertaken without significant disruption to other land uses in the area.

In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

4.2. Objectives

OBJECTIVE: To ensure that the design of the facility responds to the identified environmental constraints and opportunities

From the specialist investigations undertaken for the proposed Zen Wind Energy Facility development site, areas of high sensitivity were identified (refer to Figure 1.2). Regarding the micro-sting of the wind turbines and associated infrastructure, from an ecological point of view, wind turbines which are within ecologically sensitive areas and whose locations should be adjusted/ shifted.

Project component/s	Project components affecting the objective: » Wind turbines » Access roads » Crane hardstand areas » All other associated infrastructure. ~~» Substation~~ ~~» Power line~~
Potential Impact	» Design fails to respond optimally to the identified environmental considerations
Activities/risk sources	» Positioning of turbines and access roads ~~» Positioning of substation~~ » ~~Alignment of power line~~
Mitigation: Target/Objective	» To ensure that the design of the facility responds to the identified environmental constraints and opportunities

Mitigation: Action/control	Responsibility	Timeframe
Consider design level mitigation measures recommended by	Engineering Design	Tender design, design

Mitigation: Action/control	Responsibility	Timeframe
the specialists, especially with respect to visual aesthetics, noise, flora, ecology, avifauna and bats as detailed within the EIA report and relevant appendices.	Consultant / turbine supplier Developer	review stage
As far as possible, access roads and cable trenches which could potentially impact on sensitive areas should be shifted in order to avoid these areas of high sensitivity (i.e. best practice is impact avoidance). Where this is not possible, alternative mitigation measures as detailed in this report must be implemented.	Engineering Design Consultant Developer	Tender design, design review stage
A walk-though survey of final infrastructure positions for the wind energy facility and associated infrastructure (including the power line) should be undertaken by a specialist ecologist, avifaunal specialist and heritage specialist prior to the commencement of construction. The EMPr for construction must be updated to include site-specific information and specifications resulting from the final walk-though surveys. This EMPr must be submitted to DEA for approval prior to the commencement of construction.	Specialists	Final design phase
A comprehensive search for protected plant and animal populations must be undertaken within the footprint of the proposed infrastructure prior to construction, once the final position of infrastructure is known. For plants, this must take place during an appropriate season to maximise the likelihood of detecting plants of conservation concern. If any plants or animals of conservation concern are found within areas proposed for infrastructure, localised modifications in the position of infrastructure must be made (if possible) to avoid such populations and a suitable buffer zone around them applied, where applicable. Where it is not possible to relocate infrastructure, a permit may be required to be obtained in terms of Chapter 7 of the National Environmental Management: Biodiversity Act to carry out a restricted activity involving a specimen of a listed threatened or protected species. Should TOPS species be identified during the final ecological survey, in terms of the NEM:BA a permit (a TOPS permit) will be required for any activities/ removal of TOPS listed species. Plucking, relocation, or destruction of provincially protected species will require a permit in terms of the Nature and Environmental Conservation Ordinance of 1974 and the Western Cape Nature Conservation Laws Amendment Act, 2000 (Ordinance 3 of 2000).	Developer	Planning Phase and/ prior to construction
Should the layout (or type of wind turbines used) change significantly during the final design, the new layout must be submitted to the DFFE.	Developer	Design phase
It is recommended that any revised / updated layout be remodelled/ reviewed in terms of the potential environmental impacts by an independent acoustics specialist.	Developer	Design phase
The monitoring programme already implemented to document the effect of the wind turbines on birds and bats should be continued. This should continue during construction and during	Developer in consultation with relevant Specialist	Pre-construction, construction, operation

Mitigation: Action/control	Responsibility	Timeframe
operation. The monitoring protocols as required by the EIA report should be implemented.		
Use bird-friendly power line tower and conductor designs.	Developer	Design phase
Anti-collision devices such as bird flappers must be installed where power lines cross avifaunal sensitive areas (e.g. grasslands, rivers, wetlands, and dams). The input of an avifaunal specialist must be obtained for the fitting of the anti-collision devices onto specific sections of the line once the alignment has been confirmed through negotiation with the affected landowners, and the exact positions of the towers have been surveyed and pegged. Additional areas of high sensitivity along the preferred alignment must also be identified by the avifaunal specialist for the fitment of anti-collision devices. These devices must be according to Eskom's Transmission Guidelines.	Developer	Design phase
Compile a comprehensive stormwater management plan for hard/compacted surfaces (e.g. ~~substation footprints,~~ roads) as part of the final design of the project.	Developer	Design phase
It is possible that in situ archaeological sites/remains, and human remains may be uncovered during construction. Therefore the ECO should be trained to identify heritage resources.	Relevant specialists Developer	Design phase
Make use of existing roads where possible.	Relevant specialists Developer	Design phase
Applications for all other relevant and required permits if required to be obtained by the developer must be submitted to the relevant regulating authorities. This includes permits for the transporting of all components (abnormal loads) to site, water use licencing for disturbance to any water courses/ drainage lines and a permit to remove heritage artefacts and/ disturbance of protected vegetation.	The developer	Planning & Design Phase

Performance Indicator	» Design meets objectives and does not degrade the environment » Design and layouts respond to the mitigation measures and recommendations in the EIA report. ~~» Power line alignment which meets environmental objectives.~~ ~~» Substation site and turbine layout minimises any negative environmental impacts and maximises any benefits.~~ » Specialists appointed to undertake required surveys
Monitoring	» Ensure that the design implemented meets the objectives and mitigation measures in the EIA report through review of the design by the Project Manager and Environmental Control Officer (ECO) prior to the commencement of construction.

OBJECTIVE: Undertake Bird and Bat Monitoring Programme during the Operational phase

A pre-construction bird and bat monitoring programme has been implemented by the Developer (in consultation with an avifauna and bat specialist) to establish population sizes and any migration routes,

and to determine risk of impacts associated with the wind energy facility based on flight behaviour and patterns. This pre-construction monitoring is being undertaken in accordance with the requirements of the guidelines for bird and bat monitoring in South Africa, as well as in line with international best practice. This monitoring should continue during construction and operation of the wind farm. This is seen as critical to furthering the understanding of avifaunal impacts and wind energy facilities on the site and in South Africa.

Project component/s	~~» Power line~~ » Wind turbines
Potential Impact	» Mortality of birds due to collision with turbines and/or power line infrastructure. » Mortality of bats due to collision with turbines and/or barotrauma.
Activity/risk source	» Turbines and power line infrastructure
Mitigation: Target/Objective	» The delivery of an effective impact mitigation scheme for the facility, informed initially by influence of pre-construction monitoring on final construction plans, and refined by post-construction monitoring of actual impacts, and resulting adjustments in management practices and mitigation measures applied.

Mitigation: Action/control	Responsibility	Timeframe
Appoint advising consultant/s to undertake bird and bat monitoring during construction and operation of the wind energy facility.	Developer	Pre-construction
Potential bat roosts, specifically large mature trees, buildings and rocky crevices, are buffered by 500m, inside which no turbine infrastructure may be placed. These buffers have been mapped and are to blade tip.	EPC Contractor	Pre-construction
Develop and implement a post-construction bat monitoring programme which includes carcass searches for bats during the first two years of operation, to be fully compliant with Aronson et al. (2020). Should post- construction fatality monitoring reveal high levels of fatality, automated real-time bat monitoring and analysis systems are recommended as the primary method for automated and near-real-time bat fatality mitigation.	EPC Contractor	Pre-construction
Design and implement a noise monitoring program, measuring ambient sound levels before construction activities start, as well as during the operational phase (recommended at NSR18/19, as well as NSR12 and NSR13);	Developer / EPC Contractor	Pre-construction

Performance Indicator	» Regular provision of information on the interface between the local avifauna and bats and the proposed/operating renewable energy facility » Clear and logical recommendations on why, how and when to institute mitigation measures to reduce avian and bat impacts of the development, from pre-construction to operational phase » Quantifiable reductions in avian impacts once the facility is operational
Monitoring	» 3-monthly and annual reports produced by the scientist advising the monitoring project.

OBJECTIVE: Minimise stormwater runoff (guideline for stormwater management plan)

Management of stormwater will be required during the construction and operational phases of the facility. A detailed storm water management plan is required to be compiled as part of the final design to ensure compliance with applicable regulations and to prevent off-site migration of contaminated storm water or increased soil erosion. The section below provides a guideline for the management of storm water on site and will need to be supplemented with the relevant method statements during the construction and operation phases of the facility.

Project Component/s	» Storm water management components. » Any hard engineered surfaces (i.e. access roads).
Potential Impact	» Poor storm water management and alteration of the hydrological regime (i.e. drainage lines).
Activities/Risk Sources	» Construction of the facility (i.e. placement of hard engineered surfaces).
Mitigation: Target/Objective	» Appropriate management of storm water to minimise impacts on the environment.

Mitigation: Action/Control	Responsibility	Timeframe
A stormwater management plan which considers the recommendations below is to be submitted to the DFFE prior to the commencement of construction.	Developer EPC contractor	Pre-construction
Ensure design aims to reduce the potential increase in surface flow velocities and the resultant impact on the localised drainage system through increased sedimentation.	Developer	Planning and design
Appropriately plan hard-engineered bank erosion protection structures to minimise erosion potential.	Developer	Planning and design
Ensure suitable handling of storm water within the site (i.e. separate clean and dirty water streams around the plant and install stilling basins to capture large volumes of run-off, trapping sediments and reduce flow velocities) through appropriate design of the facility.	Developer	Construction and operation
Design measures for stormwater management needed to allow for surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows.	Developer	Planning and design

Performance Indicator	» Appropriate storm water management measures included within the facility design. » Sound water quality and quantity management during construction and operation.
Monitoring	» Devise a suitable surface water quality monitoring plan for implementation during construction and operation.

OBJECTIVE: To ensure effective communication mechanisms

On-going communication with affected and surrounding landowners is important to maintain during the construction and operational phases of the wind energy facility. Any issues and concerns raised should be addressed as far as possible in as short a timeframe as possible.

Project component/s	» wind energy facility
Potential Impact	» Impacts on affected and surrounding landowners and land uses
Activity/risk source	» Activities associated with wind energy facility construction » Activities associated with wind energy facility operation
Mitigation: Target/Objective	» Effective communication with affected and surrounding landowners » Addressing of any issues and concerns raised as far as possible in as short a timeframe as possible

Mitigation: Action/control	Responsibility	Timeframe
Compile and implement a grievance mechanism procedure for the public (as outlined in Appendix H) to be implemented during both the construction and operational phases of the facility. This procedure should include details of the contact person who will be receiving issues raised by interested and affected parties, and the process that will be followed to address issues.	Developer	Pre-construction (construction procedure) Pre-operation (operation procedure)
Develop and implement a grievance mechanism for the construction, operational and closure phases of the project for all employees, contractors, subcontractors and site personnel. This procedure should be in line with the South African Labour Law.	Developer	Pre-construction (construction procedure) Pre-operation (operation procedure)

Performance Indicator	» Effective communication procedures in place.
Monitoring	» An incident reporting system should be used to record non-conformances to the EMPr.

6 MANAGEMENT PROGRAMME FOR THE WIND ENERGY FACILITY: CONSTRUCTION

5.1. Overall Goal for Construction

Overall Goal for Construction: Undertake the construction phase of the Wind Energy Facility in a way that:

- Ensures that construction activities are properly managed in respect of environmental aspects and impacts.
- Enables the Wind Energy Facility construction activities to be undertaken without significant disruption to other land uses in the area, in particular concerning noise impacts, traffic and road use, and effects on local residents.
- Minimises the impact on the vegetation and habitat value of the site and where possible adds to the botanical and faunal record of this area.
- Minimises the impact on the archaeological and historical value of the site and where possible adds to the archaeological record of this area.
- Minimises impacts on birds, bats and other fauna using the site.
- Establishes an environmental baseline during construction activities on the site, where possible, particularly with regard to priority bird and bat species using the site.

5.2. Institutional Arrangements: Roles and Responsibilities for the Construction Phase of the Renewable Energy Facility

As the holder of the EA, FE Bonne Esperance (Pty) Ltd must ensure that the implementation of the proposed project complies with the requirements of all environmental authorisations and permits, and obligations emanating from other relevant environmental legislation. This obligation is partly met through the development of the EMPr, and the implementation of the EMPr through its integration into the contract documentation.

OBJECTIVE: To establish clear reporting, communication and responsibilities in relation to environmental incident

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Project Manager; Site Manager; Environmental Control Officer and Contractor for the construction phase of this project are as detailed below.

The **Project Manager** will:

- Ensure of all specifications and legal constraints specifically concerning the environment are highlighted to the Contractor(s) so that they are aware of these.
- Ensure that the Developer and its Contractor(s) are made aware of all stipulations within the EMPr.
- Ensure that the EMPr is correctly implemented throughout the project by means of site inspections and meetings. This will be documented as part of the site meeting minutes.
- Be fully conversant with the Environmental Impact Assessment for the project, the EMPr, the conditions of the Environmental Authorisation (once issued), and all relevant environmental legislation.

The **Site Manager** (the Developer's On-site Representative) will:

» Be fully knowledgeable with the contents of the Environmental Impact Assessment.
» Be fully knowledgeable with the contents and conditions of the Environmental Authorisation (once issued).
» Be fully knowledgeable with the contents of the Environmental management programme.
» Be fully knowledgeable with the contents of all relevant environmental legislation, and ensure compliance with these.
» Have overall responsibility of the EMPr and its implementation.
» Conduct audits to ensure compliance to the EMPr.
» Ensure there is communication with the Project Manager, the Environmental Control Officer, and relevant discipline Engineers on matters concerning the environment.
» Ensure that no actions are taken which will harm or may indirectly cause harm to the environment, and take steps to prevent pollution on the site.
» Confine activities to the demarcated construction site.

An independent **Environmental Control Officer** (ECO) must be appointed by FE Bonne Esperance (Pty) Ltd prior to the commencement of any authorised activities. The ECO will be responsible for monitoring, reviewing, and verifying compliance by the Contractor with the environmental specification of the EMPr and the conditions of the Environmental Authorisation. The ECO will:

» Be fully knowledgeable with the contents with the Environmental Impact Assessment.
» Be fully knowledgeable with the contents with the conditions of the Environmental Authorisation (once issued).
» Be fully knowledgeable with the contents with the Environmental management programme.
» Be fully knowledgeable with the contents with all relevant environmental legislation, and ensure compliance with them.
» Ensure that the contents of the EMPr are communicated to the Contractor site staff and that the Site Manager and Contractor are constantly made aware of the contents through discussion.
» Keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO.
» Keep and maintain a detailed incident (including spillage of bitumen, fuels, chemicals, or any other material) and complaints register on site indicating how these issues were addressed, what rehabilitation · measures were taken and what preventative measures were implemented to avoid re-occurrence of incidents/complaints.
» Keep and maintain a daily site diary.
» Keep copies of all reports submitted to DEA.
» Keep and maintain a schedule of current site activities including the monitoring of such activities.
» Obtain and keep record of all documentation including: environmental authorisation from DEA, EMPr, Site layout plan, method statement, all communication detailing changes that may have environmental implications, site inspection checklist, Environmental awareness training attendance register, Environmental incident report, environmental performance certificates (once a project has been completed) photographic records (before, during and after development), records of non-compliance and corrective action taken to remediate, permits, licenses, and authorisations such as waste disposal certificates, hazardous waste landfill site licenses etc. which are required by this facility.
» Compile a monthly monitoring report and submit to DEA.

Contractors and Service Providers: All contractors (including sub-contractors and staff) and service providers are ultimately responsible for:

- Ensuring that the activities conducted on site are compliant with all permits, Environmental Authorisations and all Local and National Legislation.
- Ensuring adherence to the environmental management specifications.
- Ensuring that Method Statements are submitted to the Site Manager (and ECO) for approval before any work is undertaken. Any lack of adherence to this will be considered as non-compliance to the specifications of the EMPr.
- Ensuring that any instructions issued by the Site Manager on the advice of the ECO are adhered to.
- Ensuring that a report is tabled at each site meeting, which will document all incidents that have occurred during the period before the site meeting.
- Ensuring that a register is kept in the site office, which lists all transgressions issued by the ECO.
- Ensuring that a register of all public complaints is maintained.
- Ensuring that all employees, including those of sub-contractors receive training before the commencement of construction in order that they can constructively contribute towards the successful implementation of the EMPr (i.e. ensure their staff are appropriately trained as to the environmental obligations).

5.3. Objectives

In order to meet the goal outlined in Section 5.1, the following objectives have been identified, together with necessary actions and monitoring requirements.

OBJECTIVE: Site establishment and securing the site

Site establishment is the first activity which is to be undertaken within the construction phase. Appropriate measures are required to be undertaken in order to minimise potential impacts on identified sensitive areas (refer to Figure 1.2).

Project component/s	» Wind turbines » Access roads » ~~Substation~~ » ~~Power Line~~
Potential Impact	» Hazards to landowners/public » Security of materials » Substantially increased damage to natural vegetation
Activities/risk sources	» Open excavations (foundations and cable trenches) » Movement of construction vehicles in the area and on-site
Mitigation: Target/Objective	» To secure the site against unauthorised entry » To protect members of the public/landowners/residents » No loss of or damage to natural vegetation in areas outside immediate development footprint; measured monthly during duration of construction.

Mitigation: Action/control	Responsibility	Timeframe
Secure site, working areas and excavations in an appropriate manner, as agreed with the ECO.	Contractor ECO	Erection: during site establishment Maintenance: duration of contract
Where necessary to control access, fence and secure area and implement access control procedures.	Contractor	Erection: during site establishment Maintenance: duration of contract
Fence and secure Contractor's equipment camp.	Contractor	Erection: during site establishment Maintenance: duration of contract
Fence off development footprints in sensitive areas in order to minimise disturbance to adjacent sensitive areas and to ensure it is clear to contractors where disturbance is permitted.	ECO	Prior to any construction activity
Minimise vegetation clearance or removal associated with site establishment activities, in line with an appropriate Plant Rescue and Protection Plan if required.	Contractor	Site establishment
All development footprints for roads, buildings, underground cables, laydown areas and turbines should be appropriately fenced off and clearly marked. There is to be no disturbance outside these demarcated areas.	Contractor	Erection: during site establishment Maintenance: duration of contract
Establish the necessary ablution facilities with chemical toilets. Provide adequate sanitary facilities and ablutions for construction workers (1 toilet per every 15 workers) at appropriate locations on site.	Contractor	Erection: during site establishment Maintenance: duration of contract
Ablution or sanitary facilities should not be located within 100 m from a 1:100 year flood line including water courses, wetlands or within a horizontal distance of less than 100 m, whichever is applicable	Contractor	During site establishment, construction, maintenance
Supply adequate, contained and accessible waste collection bins and skips at site where construction is being undertaken. All work sites must be kept free of waste. No solid waste may be burned or buried on site or disposed of by any other method on site or within quarries or borrows pits. Remove stored domestic waste to the nearest registered solid waste disposal facility.	Contractor	Erection: during site establishment Maintenance: duration of contract within a particular area
Liquid waste: No liquid, including grey water, may be discharged into any water body or drainage line without purification with accordance to the Department of Water Affairs' (DWA) specifications and guidelines.	Contractor	Maintenance: duration of contract within a particular area
Ensure compliance with all national, regional and local	Contractor	During and post construction.

Mitigation: Action/control	Responsibility	Timeframe
legislation with regard to the storage, handling and disposal of hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials. The onus is on the Contractor to identify and interpret the applicable legislation.		
Keep a record of all hazardous substances stored on site for submission to the ECO and follow the hazardous substance monitoring program.	Contractor	Construction.
An open space management plan must be implemented during the construction of the facility (refer to Appendix B).	Contractor	Pre-Construction
Water required for construction purposes to be sourced from legitimate sources such as the local municipality. If water to be abstracted from ground or surface water resources the relevant permit must be obtained from DWS.	Contractor	Pre-Construction

Performance Indicator	» Minimum vegetation clearance associated with site establishment activities. » No unnecessary environmental impacts associated with site established. » Site is secure and there is no unauthorised entry. » No members of the public/ landowners injured as a result of construction activities.
Monitoring	» An incident reporting system will be used to record non-conformances to the EMPr » ECO to monitor all construction areas on a continuous basis until all construction is completed; immediate report backs to site manager in terms of non-conformances recorded.

OBJECTIVE: Limit disturbance of vegetation and loss of protected flora during construction

Project component/s	» Any infrastructure or activity that will result in disturbance to natural areas
Potential Impact	» Loss of indigenous natural vegetation due to construction activities
Activity/risk source	» Site preparation and earthworks » Construction-related traffic » Foundations or plant equipment installation » Mobile construction equipment » Power line construction activities » Dumping or damage by construction equipment outside of demarcated construction areas.
Mitigation: Target/Objective	» Minimal loss of natural vegetation

Mitigation: Action/control	Responsibility	Timeframe
The plant rescue and protection plan should be implemented if required.	Developer Contractor	Construction
The construction impacts must be contained to the footprint of the infrastructure.	Developer Contractor	Construction

Mitigation: Action/control	Responsibility	Timeframe
Internal access roads and underground cables should be aligned as far as possible along existing linear disturbances.	Developer Contractor	Construction
Unnecessary impacts on surrounding natural vegetation must be avoided.	Developer Contractor	Construction
Rehabilitate any disturbed areas as soon as possible after construction is completed in an area in order to stabilise landscapes.	Developer Contractor	Construction

Performance Indicator	» No loss of natural vegetation within areas deemed as sensitive. » No impact on vegetation outside of demarcated construction areas.
Monitoring	» None

OBJECTIVE: Limit disturbance and impact on the Kleinberg River and drainage lines on the site

The major drainage feature which occurs within the site is Klein Berg River which bisects the site, more or less parallel to the R44. Historically the Klein Berg River would have contained a lot of riparian vegetation as well as an extensive associated floodplain. Today, this area has been very heavily impacted by agriculture and little of the original vegetation still exists. The banks of the river are dominated by alien woody species, mainly *Eucalyptus camaldulensis*, *Acacia saligna* and *Sesbania punicea*. Along the banks and side channels, species such as *Bolboschoenus maritimus*, *Cotula turbinata*, *Cotula coronopifolia*, *Persicaria attenuata* subsp. *attenuata* and *Rumex crispus* were observed. Outside of the main channel itself, the floodplain consists of sandy flats and hummocks dominated by *Cynodon dactylon* and various shrubs and forbs such as *Wiborgia fusca* subsp. *fusca*, *Eriocephalus africanus* var. *africanus*, *Galenia africana*, *Leysera gnaphalodes*, *Lobelia erinus* and *Monopsis simplex*. Alien species were also common or dominant in this area and included *Bromus diandrus*, *Echium plantageum*, *Lolium rigidum*, *Polypogon monspeliensis*, *Erodium cicutarium*, *Hordeum murinum* and *Hypochaeris radicata*. Despite the obvious degradation of the area, the river and floodplain are considered sensitive on account of the ecological role and function provided by the riverine corridor. This area was identified as sensitive during the EIA and the development footprint largely avoids impact to this area, with the only infrastructure elements within this area being the access roads and power line infrastructure. There are no turbines located within the floodplain of the river and the Klein Berg River would not be directly impacted by the development. However, an upgrade to the current farm bridge is required for access to the site.

Away from the Klein Berg River, there are a number of small dams on the property which are used for livestock watering and a newly built larger dam which is presumably for irrigation purposes. The dams are fringed by *Cynodon dactylon* with sedges and forbs such as *Bolboschoenus maritimus*, with occasional larger species such as *Typha capensis* and *Pseudoschoenus inanis*. The inflows of the dams have developed into small wetlands with species such as *Pennisetum macrourum* and *Micranthus alopecuroides* present.

The minor drainage lines within the site have been heavily impacted and most have been canalized or are incised as a result of erosion, internal access roads to the wind turbines may impact on drainage lines. There is little vegetation within the eroded channels themselves, but some remnants of the original flanking

vegetation persist and includes species such as *Salvia africana-caerulea*, *Athanasia trifurcata*, *Dicerothamnus rhinocerotis*, *Berkheya rigida*, *Senecio pubigerus*, *Relhania fruticosa* and *Conyza scabrida* as well as the usual complement of alien annual grasses. Due to the habitat these areas provide as well as their ecological role in flow regulation, these areas should be disturbed as little as possible.

Project component/s	» Any infrastructure or activity that will result in disturbance to drainage lines
Potential Impact	» Damage to drainage lines by any means that will result in hydrological changes (includes erosion, siltation, dust, direct removal of soil of vegetation). The focus should be on the functioning of the watercourse as a natural system.
Activity/risk source	» Site preparation and earthworks » Construction-related traffic » Foundations or plant equipment installation » Mobile construction equipment » Power line construction activities » Dumping or damage by construction equipment outside of demarcated construction areas.
Mitigation: Target/Objective	» No unauthorised changes or damage to drainage lines or watercourses within project area.

Mitigation: Action/control	**Responsibility**	**Timeframe**
Ensure that power line towers are constructed at least 32 m from the drainage lines (i.e. span the drainage lines)	Developer, Contractor, ECO	Construction, Operation
The construction impacts must be contained to the footprint of the infrastructure.	Developer, Contractor, ECO	Construction, Operation
Rehabilitate any disturbed areas as soon as possible after construction is completed in an area.	Developer, Contractor, ECO	Construction, Operation
Develop and implement an appropriate stormwater management plan for all infrastructure.	Developer, Contractor, ECO	Construction, Operation
Infrastructure (including culverts and/or bridges) should not be placed within drainage line channels but should span them completely.	Developer, Contractor, ECO	Construction, Operation
Make use of existing access roads. If extra tracks are needed to conduct any activities on site, ensure that they are not in contravention of any environmental legislation or the EMPr.	Developer, Contractor, ECO	Construction, Operation
Stabilise banks using erosion control (gabions baskets, geotextile material / reno mattresses/hessian etc.) prior to any construction work in the vicinity on the Klein Berg River	Developer, Contractor, ECO	Construction
A comprehensive rehabilitation plan be implemented from the project onset within watercourse areas (including buffers) to ensure a net benefit to the aquatic environment.	Developer, Contractor, ECO	Construction

Performance Indicator	» No unauthorised impacts on water quality, water quantity, drainage lines/vegetation, natural status of watercourses
Monitoring	» Habitat loss in watercourses should be monitored before and after construction. » The presence and development of erosion features downstream of any construction through drainage lines must be monitored.

OBJECTIVE: Control alien invasive plants

The Conservation of Agricultural Resources Act defines different categories of alien plants and those listed under Category 1 are prohibited and must be controlled while those listed under Category 2 must be grown within a demarcated area under permit. Category 3 plants includes ornamental plants that may no longer be planted but existing plants may remain provided that all reasonable steps are taken to prevent the spreading thereof, except within the floodline of water courses and wetlands.

A wide variety of alien species are already present at the site and so further disturbance would serve to exacerbate these problems. Within areas that have not been ploughed for some time, diversity is significantly higher than the cultivated areas, but a large proportion of the species present on the site are alien species such as *Bromus tectorum*, *Bromus japonicus*, E*chium plantagineum* and *Hypochaeris radicata*. *Eucalyptus camaldulensis*, *Acacia saligna* and *Sesbania punicea*. Along the banks and side channels, species such as *Bolboschoenus maritimus*, *Cotula turbinata*, *Cotula coronopifolia*, *Persicaria attenuata* subsp. *attenuata* and *Rumex crispus* were observed along the Klein Berg River.

On-going alien and invasive plant monitoring and removal should be undertaken on all areas of natural vegetation within the project lease area on an annual basis. The section below provides a guideline for the Invasive Plant Management Plan and should be implemented together with consideration of the principles contained in the DWS:

Project component/s	» Any infrastructure or activity that will result in disturbance to natural areas
Potential Impact	» Invasion of natural vegetation surrounding the site by declared weeds or invasive alien species
Activity/risk source	» Construction activities
Mitigation: Target/Objective	» No alien plants within project control area

Mitigation: Action/control	Responsibility	Timeframe
Avoid creating conditions in which alien plants may become established: a. keep disturbance of indigenous vegetation to a minimum b. rehabilitate disturbed areas as quickly as possible c. do not import soil from areas with alien plants	Contractor ECO	Construction
Establish an on-going monitoring programme to detect and quantify any alien species that may become established and identify the problem species (as per Conservation of Agricultural Resources Act)	Contractor ECO	Construction
Immediately control any alien plants that become established using registered control methods	Contractor ECO	Construction
Cleared alien vegetation must not be dumped on adjacent intact vegetation during clearing but should be temporarily stored in a demarcated area	Contractor ECO	Construction
Removal of alien invasive species or other vegetation and follow-up	Contractor	Construction

Mitigation: Action/control	Responsibility	Timeframe
procedures must be in accordance with the Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983).	ECO	
Larger woody species such as *Acacia saligna* should be managed, especially along the floodplain of the Klein Berg River.	Contractor ECO	Construction

Performance Indicator	» For each alien species: number of plants and aerial cover of plants within project area and immediate surroundings
Monitoring	» On-going monitoring of area by environmental control officer during construction » On-going monitoring of area by environmental manager during operation » Annual audit of project area and immediate surroundings by qualified botanist. If no species are detected, then this can be stated. If any alien invasive species are detected then the distribution of these should be mapped (GPS co-ordinates of plants or concentrations of plants), number of individuals (whole site or per unit area), age and/or size classes of plants and aerial cover of plants. The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the project area. The environmental manager should be responsible for driving this process. Reporting frequency depends on legal compliance framework.

OBJECTIVE: Limit disturbance of vegetation and loss of faunal habitat during construction

Game farming does occur on the site. Free-ranging species observed during the site visit includes Steenbok, Common Duiker, Vlei Rat, Cape Grey Mongoose, Cape Porcupine, African Mole Rat, Cape Mole Rat and Cape Gerbil. Three species of conservation concern potentially occur at the site, i.e. the White-tailed Mouse (Endangered), Leopard (Near Threatened) and the Honey Badger (SA RDB Endangered). Very few reptiles were observed at the site and the only species observed was the Angulate Tortoise.

Project component/s	» All activities which require or result in the clearing of or impact to vegetation
Potential Impact	» Loss of faunal habitat and impacts on resident listed and non-listed species
Activity/risk source	» Site preparation and earthworks » Construction-related traffic » Foundations or plant equipment installation » Mobile construction equipment » Power line construction activities
Mitigation: Target/Objective	» Minimal impact on terrestrial environment. » Reduced impact and disturbance of terrestrial fauna

Mitigation: Action/control	Responsibility	Timeframe
Demarcate important or sensitive areas as no-go areas.	Specialist, ECO	Pre-construction
Any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.	Specialist, ECO	Construction
The 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.	Specialist, ECO	Construction
Prior to construction, the game that is farmed on the site should be	ECO	Construction

Mitigation: Action/control	Responsibility	Timeframe
moved to a separate came outside of the construction footprint for the wind energy facility.	Contractor Landowner	
Vegetation clearing should occur in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment, and suitable dust and erosion control mitigation measures should be included in the EMPr to mitigate the impact.	ECO	Construction

Performance Indicator	» Walk-through report identifying sensitive areas. » Adjustments to final layout to avoid these areas
Monitoring	» Monitor alien plant abundance an annual basis. » Document re-vegetation actions taken and their success » Document erosion problems and the control measures implemented.

OBJECTIVE: A Wind Energy Facility that is sustainable in terms of its impacts on birds and bats

The potential interactions between birds and the proposed facility are: disturbance of birds during construction and maintenance; habitat destruction during construction and maintenance of the facility and associated infrastructure; displacement of birds from the site, or from flying over the site; collision of birds with turbine blades during operation; and collision and electrocution of birds on associated electrical infrastructure.

Bats have been found to be particularly vulnerable to being killed by wind turbines. It has long been a mystery why they should be so badly affected since bat echo-location allows them to detect moving objects very well. A recent study in America has found that the primary cause for mortality is a combination of direct strikes and barotrauma (bats are killed when suddenly passing through a low air pressure region surrounding the turbine blade tips causing low pressure damage the bat's lungs).

A pre-construction bird and bat monitoring programme was undertaken on site, in accordance with the South African best practice guidelines currently available. Areas of potential significance have been identified through this study, and bird and bat species occurring on the site have been recorded. Appropriate management measures are required to be implemented to ensure this impact is minimised as far as possible.

The cumulative effect of the three currently proposed wind farms in the region will form a barrier across the migration route of large numbers of waterbirds and specifically the risk this imposes on the GLOBAL population of the South African Shelduck. Mitigation may be achieved by deployment of radar devices that detect approaching birds and temporarily close turbine operation. If that approach fails to adequately mitigate mortalities to acceptable levels, suspension of operation of turbines at night during the months of waterbird migration will need to be implemented.

Project component/s	» Wind turbines » Access roads ~~» Substation linking the facility to the electricity grid~~

	» Underground cabling » ~~Power lines~~
Potential Impact	» Disturbance to or loss of birds and bats as a result of collision with the turbine blades » ~~Disturbance to or loss of birds as a result of collision with the overhead power lines~~ » ~~Electrocution on power line and substation~~
Activity/risk source	» Results of pre-construction monitoring not integrated into the final layout and/or the mitigation scheme » Lack of clear communication between the scientist analysing the monitoring data and the client » Misinterpretation of either monitoring data
Mitigation: Target/Objective	» No significant impacts on identified bird or bat species of concern. » The delivery of an effective impact mitigation scheme for the facility, informed initially by influence of pre-construction monitoring on final construction plans, and refined by post-construction monitoring of actual impacts, and resulting adjustments in management practices and mitigation measures applied

Mitigation: Action/control	Responsibility	Timeframe
Ensure construction EMPr is applied, with particular reference to minimising the temporary and permanent development footprint, and the extent and duration of noise and movement disturbance, and ensuring that stipulations re sensitive areas and times are adhered to.	Environmental Control Officer	During construction
Conduct bird and bat monitoring during the construction and operational phases	Advising avifauna consultant	Construction and Operational
Refine post-construction monitoring protocol in terms of results from pre-construction.	Advising avifauna consultant	As soon as possible / practical after construction completed
Bird diverters must be installed on the new power line.	Contractor	Construction
Deployment of radar devices that detect approaching birds and temporarily suspend turbine operation. If the above approaches fail to mitigate mortalities – closure of turbines at night during the months of waterbird migration.	Developer and avifauna specialist	Construction and Operational

Performance Indicator	» Regular provision of information on the interface between the local avifauna and bats and the proposed/operating Wind Energy Facility » Clear and logical recommendations on why, how and when to institute mitigation measures to reduce avian/bat impacts of the development, from pre-construction to operational phase » Quantifiable reductions in avian/bat impacts once the facility is operational
Monitoring	» Map extent of suitable habitats for priority species before construction. » Identify project components that infringe on habitat and or longevity of species of concern. » After construction, record any disturbance to habitat in terms of extent and potential effects on remaining habitat. » 3-monthly and annual reports produced by the scientist advising the monitoring project

OBJECTIVE: To avoid and or minimise the potential risk of increased veld fires during the construction phase

Uncontrolled, unplanned fires will not serve their desired purpose and may serve to place the vegetation in the study area and the people at risk of veld fires.

Project component/s	Construction and establishment activities associated with the wind energy facility and associated infrastructure
Potential Impact	Veld fires can pose a personal safety risk to local farmers and communities, and their homes, livestock and farm infrastructure, such as gates and fences.
Activities/risk sources	The presence of construction workers and their activities on the site can increase the risk of veld fires.
Mitigation: Target/Objective	To avoid and or minimise the potential risk of veld fires on local communities and their livelihoods.

Mitigation: Action/control	**Responsibility**	**Timeframe**
Ensure that open fires on the site for cooking or heating are not allowed except in designated areas.	Contractor	Duration of construction
Provide adequate fire fighting equipment onsite.	Contractor	Duration of construction
Provide fire-fighting training to selected construction staff.	Contractor	Duration of construction
Compensate farmers / community members at full market related replacement cost for any losses, such as livestock, damage to infrastructure etc., for losses associated with fires resulting from negligence or non-compliance.	Contractor	As required

Performance Indicator	» Designated areas for fires identified on site at the outset of the construction phase. » Fire fighting equipment and training provided before the construction phase commences. » Compensation claims settled within 1 month of claim being verified by Community Monitoring Forum.
Monitoring	» FE Bonne Esperance (Pty) Ltd and or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

OBJECTIVE: Minimise soil degradation and erosion (Erosion management Plan)

The natural geological profile including bedrock and soil cover must be preserved as far as possible to minimise unforeseen impacts on the surrounding environment.

A set of strict mitigation measures are required to be implemented in order to effectively limit the impact on the geological environment. The proposed disturbance areas - where construction activity is likely to occur - are the focus of the mitigation measures laid out below.

Management of erosion will be required during the construction phase of the facility. An erosion management plan is required to ensure compliance with applicable regulations and to prevent increased

soil erosion and sedimentation of the downstream environment. The section below provides a guideline for the management of erosion on site and will need to be supplemented with the principles for erosion management contained in the Erosion Management Plan included in Appendix D.

Project component/s	» Wind turbines » Access roads » ~~Substation linking the facility to the electricity grid~~ » Underground cabling » ~~Power line~~
Potential Impact	» Soil and rock removal » Soil mixing, wetting, stockpiling, compaction » Soil pollution » Accelerated soil erosion » Increased deposition of soil into drainage systems » Increased run-off over the site » Dust pollution
Activities/risk sources	» Construction activity – earthworks & transportation across site » Machinery, chemicals and human waste – soil pollutants » Rainfall - water erosion of disturbed areas » Wind erosion of disturbed areas
Mitigation: Target/Objective	» To minimise size of construction disturbance areas » To minimise destructive activity within disturbance areas & prevent unnecessary activity outside of disturbance areas » To minimise soil degradation (removal, excavation, mixing, wetting, compaction, pollution, erosion, etc.) » To minimise deposition of soil into drainage lines » To minimise the loss of topsoil » To minimise dust pollution

Mitigation: Action/control	Responsibility	Timeframe
Blasting (if required) must be undertaken in line with the relevant blasting and construction regulations of South Africa	Contractor	Construction
Identify areas of high erosion risk (drainage lines/watercourses). Only special works to be undertaken in these areas to be authorised by ECO and Engineer's representative (ER).	ECO/ER/Contractor	Before and during construction
Identify disturbance areas for general construction work and restrict construction activity to these areas.	ECO/ER/Contractor	Before and during construction
Prevent unnecessary destructive activity within disturbance areas (prevent over-excavations and double handling)	ECO/ER/Contractor	Before and during construction
Access roads to be carefully planned and constructed to minimise the impacted area and prevent unnecessary degradation of soil. Special attention to be given to roads that cross drainage lines and roads on steep slopes (to prevent unnecessary cutting and filling operations).	ECO/ER/Contractor	Before and during construction
Dust control on construction site: Wetting or covering of cleared areas.	Contractor	During construction
Minimise removal of vegetation which aids soil stability.	ECO/Contractor	During construction

Mitigation: Action/control	Responsibility	Timeframe
Rehabilitate disturbance areas as soon as an area is vacated.	Contractor	During and after construction
Soil conservation: Stockpile topsoil for re-use in rehabilitation phase. Protect stockpile from erosion. As per the Erosion Management Plan in Appendix D.	Contractor	Before and during construction
Erosion control measures: Run-off control and attenuation on slopes (sand bags, logs), silt fences, stormwater channels and catch-pits, shade nets, soil binding, geofabrics, hydroseeding or mulching over cleared areas.	Contractor/ECO	Erection: Before construction Maintenance: Duration of contract
Where access roads cross natural drainage lines, culverts must be designed to allow free flow. Regular maintenance must be carried out.	ECO/ER/Contractor	Before construction and maintenance over duration of contract
Control depth of excavations and stability of cut faces/sidewalls.	ECO/ER/Contractor	Before construction and maintenance over duration of contract
A Stormwater Management Plan to be implemented during, construction of the facility.	ECO/ER	Before and during construction
Develop and implement an erosion management system for monitoring and rehabilitating erosion events associated with the facility. Appropriate erosion mitigation must form part of this system is to prevent and reduce risk of any potential erosion.	ECO/ER/Contractor	Before construction and maintenance over duration of contract
Foundations and trenches must be backfilled with originally excavated materials as and where possible. Excess excavation materials must be disposed of only in approved areas or, if suitable, stockpiled for use in reclamation activities.	Before and during construction	During construction
Determine the best ways to utilise waste rock material from excavations, preferably as part of road construction or erosion control, where necessary to avoid having to stockpile such materials	ECO/ER/Contractor	Before and during construction

Performance Indicator	» Only authorised activity outside disturbance areas » No activity in no-go areas » Acceptable level of activity within disturbance areas, as determined by ECO » Acceptable level of soil erosion around site, as determined by ECO » Acceptable level of increased siltation in drainage lines, as determined by ECO » Acceptable level of soil degradation, as determined by ECO » Acceptable state of excavations, as determined by ER & ECO
Monitoring	» Fortnightly inspections of the site » Fortnightly inspections of sediment control devices » Fortnightly inspections of surroundings, including drainage lines » Immediate reporting of ineffective sediment control systems » An incident reporting system will record non-conformances

OBJECTIVE: Maximise local employment and business opportunities associated with the construction phase

Employment opportunities could be created during the construction phase although limited. The unemployment rate in the study area is quite high and there are therefore various individuals in the area in search of employment. As indicated it is foreseen that it would be possible to make use of local labour for sections of the construction activities. Opportunities for SMMEs to be considered for some of the construction activities also exist. Employment of locals and the involvement of local SMMEs would enhance the social benefits associated with the project, even if the opportunities are only temporary. The procurement of local goods could furthermore result in positive economic spin-offs.

Project component/s	Construction and establishment activities associated with the establishment of the facility and associated infrastructure ~~such as the power line and substations~~.
Potential Impact	The opportunities and benefits associated with the creation of local employment and business should be maximised.
Activities/risk sources	» Contractors who make use of their own labour thereby reducing the employment and business opportunities for locals. » The inflow of various specialists from outside the study area and even abroad » Sourcing of individuals outside the municipal area
Mitigation: Target/Objective	The project proponent should aim to employ a maximum number of the low-skilled to semi-skilled workers from the local area where possible. This should also be stipulated in the tender documentation and contractors should adhere to this guideline. Inputs from the Ubuntu Local Municipality in this regard would be critical.

Mitigation: Action/control	Responsibility	Timeframe
Employment of local community members (e.g. source labour from within the municipal area) should be undertaken where possible.	Project proponent, Drakenstein Local Municipality & Contractor	Construction
A broad-based approach should be followed to identify and involve relevant organisations which could assist the main contractor and project proponent in identifying people whose skills may correspond with the job specifications	Project proponent, Drakenstein Local Municipality & Contractor	Construction
An equitable process should be promoted whereby locals and previously disadvantaged individuals (women) are taken into account.	Drakenstein Local Municipality & Project proponent	Construction
Create conditions that are conducive for the involvement of entrepreneurs, small businesses, and SMMEs during the construction process.	Drakenstein Local Municipality, Project proponent & Contractor	Construction
Tender documentation should contain guidelines for the involvement of labour, entrepreneurs, businesses and SMMEs from the local sector.	Project proponent & Contractor	Construction
A local labour desk should be set-up (if not already established) in the beneficiary communities to co-ordinate the process of involving local labour.	Drakenstein Local Municipality & Contractor	Construction
Communication efforts concerning job creation opportunities should refrain from creating unrealistic expectations.	Project proponent	Construction

Performance Indicator	» Job opportunities, especially of low to semi-skilled positions, are primarily awarded to members of local communities. » Locals and previously disadvantaged individuals (women) are taken into account during the hiring process. » SMMEs are awarded with contracts during the construction phase. » Labour, entrepreneurs, businesses and SMMEs from the local sector are awarded with jobs, based on requirements in the Tender Documentation. » The involvement of local labour is promoted. » Reports are not made from members of the local communities regarding unrealistic employment opportunities.
Monitoring	» Project proponent and or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

OBJECTIVE: Address economic inequities within the study area and enhance capacity building and skills training

Due to the high unemployed figures in the study area, it is also clear that there would be various unemployed persons in search of employment, even if they can only secure temporary positions. For the lower level skilled positions, outsiders would thus definitely not have to be sourced. Even though all that would be employed might not have the necessary applicable skills, this issue could be addressed through proper focused skills training and capacity building initiatives after locals have been sourced, but prior to construction activities starting.

Project component/s	Availability of required skills in the local communities
Potential Impact	The opportunities and benefits associated with the creation of local employment and business could be maximised as it is anticipated that sufficient locals would have the necessary skills to be employed.
Activity/risk source	Unavailability of locals with the required skills resulting in locals not being employed and labour be sourced from outside the Drakenstein Local Municipality area. Higher skilled positions might even be sourced internationally
Mitigation: Target/Objective	Project proponent, in discussions with the Drakenstein Local Municipality, should aim to employ a maximum number of the low-skilled workers from the local area where possible. Should the necessary skills not be readily available, skills training and capacity building should be undertaken

Mitigation: Action/control	Responsibility	Timeframe
A broad-based approach should be followed to identify and involve relevant organisations in identifying people whose skills may correspond with the job specifications.	Project proponent and Drakenstein Local Municipality	Construction
In cases for the semi-skilled jobs, where the relevant skills do not exist, training should be provided to willing local community members to enable them to fill the positions.	Project proponent and Contractor	Construction
Capacity building and skills development should include on-site training and tailor made individual packages to further each individual.	Project proponent and Contractor	Construction
Capacity building initiatives could link in with existing capacity building and skills training initiatives of the Drakenstein Local Municipality and/or other initiatives of	Project proponent and Drakenstein Local Municipality	Construction

Mitigation: Action/control	Responsibility	Timeframe
contractors.		

Performance Indicator	» A skills development plan is developed » Job opportunities, especially of lower skilled positions, are primarily awarded to members of local communities. » Skills training and capacity building initiatives are developed and implemented » Local SMMEs and/or entrepreneurs should be awarded the opportunity to become involved in the tender process.
Monitoring	» Project proponent and or appointed ECO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE: To minimise traffic related impacts (Traffic Management Plan refer to Appendix G)

Access to the farms under investigation can be obtained from the R44 to Saron. The imported wind turbines would be transported via sea to South Africa (to the Port in Cape Town) where after they would be transported along the national, secondary and local access roads to the actual site. Due to the size of the wind turbines and the abnormal size of the vehicles that would be required, some of the secondary and local roads would have to be upgraded prior to the delivery of the turbines, which would include widening of corners and/or bridges. Abnormal vehicles would have the most detrimental impact on the local roads' surface and capacity. Additional construction vehicles that would make use of the national, secondary and local roads to access the construction site(s) would include cranes, trucks, excavators, graders and those heavy vehicles transporting the materials and equipment required for especially the wind component of the proposed facility.

Project component/s	Traffic related impacts on existing road infrastructure and property owners situated along the routes to be travelled and those surrounding the construction site, as well as possible impact on local road users.
Potential Impact	Impact of abnormal sized vehicles and general heavy construction vehicles on road surfaces, and possible increased risk in accidents involving people and animals
Activities/risk sources	Construction vehicle movement Speeding on local roads Degradation of local road conditions
Mitigation: Target/Objective	Minimise the impact of the increase in abnormal and heavy vehicles on existing infrastructure, property owners, animals and road users.

Mitigation: Action/control	Responsibility	Timeframe
The contractor's plans, procedures and schedules, as well as the anticipated intrusion impacts should be clarified with affected parties prior to the construction phase.	Developer and Environmental Control Officer	Pre-Construction
All regulations and legislation pertaining to the use of provincial and local roads by abnormal vehicles to transport the wind turbines should be noted and adhered to.	Developer, Contractor and relevant government departments (national and provincial)	Pre-construction Construction
Speeding of construction vehicles should be avoided at all costs.	Contractor & Environmental Control	Construction

Mitigation: Action/control	Responsibility	Timeframe
	Officer	
Strict vehicle safety standards should be implemented and monitored.	Contractor & Environmental Control Officer	Construction
Property owners of the surrounding farms should at all times have proper access to their properties.	Contractor & Environmental Control Officer	Construction
The local gravel access roads frequently used by construction vehicles should regularly be graded by the project proponent to limit the degradation of the road surface.	Developer	Construction
Signage must be used for public road safety along the R44 during the transport and construction phases.	Developer	Construction

Performance Indicator	» Vehicles keeping to the speed limits. » Vehicles are in good working order and safety standards are implemented. » Local residents and road users are aware of vehicle movements and schedules. » Property owners have access to their properties at all times. » No traffic related accidents are experienced. » Local road conditions and road surfaces are up to standard. » Complaints of residents are not received (e.g. with regards to the speeding of heavy vehicles).
Monitoring	» FE Bonne Esperance (Pty) Ltd and/or appointed ECO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE: To minimise the potential impact on safety and security

An inflow of workers could, as a worst case scenario and irrespective of the size of the workforce, pose some security risks. Criminals could also use the opportunity due to "outsiders" being in the area to undertake their criminal activities. The actual safety of construction workers is also of concern due to the large equipment used and the size of the turbines to be erected. Further health and safety issues associated with the actual construction site include unauthorised entry to the site and construction areas, the usage of large cranes on site, the risks associated with the storage of equipment and material on site, as well as the increased risk of accidents due to the increased movement of construction vehicles on the local roads.

Other concerns relate to littering, unwanted behaviour of construction workers, transmission of Sexually Transmitted Diseases (STDs), environmental pollution, an increase risk in fires and so forth. Although such perceptions cannot be substantiated or be changed it should be sensitively dealt with. It is thus clear that even though the construction phase when these impacts could occur is only of a very short to short duration, the effects of the impacts could remain in the medium term.

Project component/s	Inflow of workers could result in increased safety and security risks.
Potential Impact	Outside workers are involved in criminal activities and/or fires occur.
Activities/risk sources	» Safety of individuals and animals are at risk

	» Theft of livestock » Theft of construction material » On-site accidents » Spread of sexually transmitted diseases » Littering and environmental pollution
Mitigation: Target/Objective	Employment of local labour should be maximised and strict security measures should be implemented at the construction site.

Mitigation: Action/control	**Responsibility**	**Timeframe**
Employing local community members could minimise the potential for criminal activity or perceived perception of an increase in criminal activity due to the presence of an outside workforce.	Contractor	Pre-Construction
Screening of workers that apply for work could be useful to lessen perceived negative perceptions about the outside workforce.	Contractor	Pre-Construction
Construction workers should be easily identifiable by wearing uniforms and even identity tags.	Contractor	Construction
Local community members and property owners should be informed of the presence of the outside workforce, the construction schedule and movement of workers.	Project proponent	Construction
Care should be taken to avoid conflict between the local communities and the "outside" workforce.	Project proponent and Contractor	Pre-Construction and Construction
Property owners, their workers, as well as local communities should be motivated to be involved in crime prevention and by reporting crimes.	Project proponent Local communities	All phases of project
The construction site should be fenced and access to the area controlled.	Project proponent and Contractor	All phases of project
Security personnel should be aware of the possibility of animal theft and poaching and should be able to identify possible criminal elements and/or criminal activities in this regard.	Project proponent and Contractor	Construction
Procedures and measures to prevent, and in worst cases, attend to fires should be developed in consultation with the surrounding property owners and Drakenstein Local Municipality.	Project proponent Drakenstein Local Municipality, Local communities	Pre-Construction and when required

Performance Indicator	» No criminal activities and theft of livestock attributed to workforce are reported. » No fires occur. » No on-site accidents occur. » No long term increase in the prevalence of STDs.
Monitoring	» Project proponent, and appointed ECO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE: To minimise the potential impact on the daily living and movement patterns and farming activities

The farm under investigation is currently used for crop production and grazing. During the construction phase some negative impacts on the resource use on the farm are anticipated due to the extent of the

construction activities. Alternative grazing areas would have to be found for the livestock currently grazing on the areas to be used for the wind turbines. Game should also be moved outside of the construction areas. Farming activities could furthermore be negatively impacted on by general intrusions and noise associated with the construction activities such as the increase in vehicular movement and possible blasting noise.

Some intrusion impacts due to the construction activities and vehicular movements (noise and dust) on the surrounding property owners could be experienced, but it is not anticipated that their farming activities would be negatively affected during the construction phase, except if construction workers and/or jobseekers would enter these properties and in the event that stock thefts occur.

Project component/s	Construction activities could impact on the farming activities undertaken on the farms under investigation, as well as impact on the activities and daily living and movement patterns of the surrounding farms
Potential Impact	» Loss of resource use » Dust and noise pollution » General intrusion
Activities/risk sources	» Possible loss of income should sheep farming not continue » Increased risk of accidents due to increase in vehicle movement » Possible degradation of local roads » Dust and noise pollution negatively affecting farming activities
Mitigation: Target/Objective	Limit any negative impacts on the farming activities and on the surrounding property owners' daily living and movement patterns

Mitigation: Action/control	Responsibility	Timeframe
Additional access roads at the construction sites should be kept to a minimum. Access roads and entrances to the site should be carefully planned to limit any intrusion on the neighbouring property owners and road users	Contractor	Construction
Noise and dust pollution should be limited . Gravel roads could be sprayed with water to limit dust creation if economically feasible and reasonable from an environmental perspective (water scarce area)	Contractor	Construction
Surrounding property owners should be notified if and when blasting would occur	Project proponent and Contractor	Construction
Construction vehicles should adhere to the speed limits and should be inspected to ensure that these are in good working order and not overloaded	Project proponent and Contractor	Construction
The movement of abnormal loads should be communicated to the property owners in the study area and the necessary permits and authorisations should be obtained from the relevant government departments	Project proponent Local communities	Construction
Source general construction material and goods locally where available to limit transportation of these over long distances	Project proponent and Contractor	Construction
The property owners affected should put pro-active measures in place to find alternative grazing areas for the sheep currently grazing on the affected areas	Project proponent	Construction

Mitigation: Action/control	Responsibility	Timeframe
Local labourers should be used during the construction phase to limit the inflow of outsiders to the area	Project proponent Drakenstein Local Municipality	Construction

Performance Indicator	» No loss of resource use and no loss of income » No noise and dust pollution » Limited intrusions on surrounding property owners » Limited or no reports from property owners regarding problems with construction activities and workforce » No degradation of local roads
Monitoring	» Project proponent, and appointed ECO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE: Noise control

Projected noise levels during construction of the Wind Energy Facility were modelled using the methods as proposed by SANS 10357:2004. The resulting future noise projections indicated that the construction activities, as modelled for the worst case scenario, would comply with the Noise Control Regulations (GN R154) as well as the acceptable day rating levels as per the SANS 10103:2008 guidelines.

Various construction activities will be taking place during the development of the facility and may pose a noise risk to them. While this study investigated likely and significant noisy activities, it did not evaluate all potential activities that could result in a noise impact. These activities could include temporary or short-term activities where small equipment is used (such as the digging of trenches to lay underground power-lines).

Project component/s	Construction of infrastructure, including but not limited to: turbine (foundation, tower, nacelle, and rotor), ~~substation(s),~~ access roads and electrical power cabling.
Potential Impact	» Increased noise levels at potentially sensitive receptors » Potentially changing the acceptable land use capability
Activity/risk source	» Any construction activities taking place within 500 m from potentially sensitive receptors
Mitigation: Target/Objective	» Ensure equivalent A-weighted noise levels below 45 dBA at potentially sensitive receptors. » Ensure that maximum noise levels at potentially sensitive receptors be less than 65 dBA. » Prevent the generation of disturbing or nuisance noises » Ensure acceptable noise levels at surrounding stakeholders and potentially sensitive receptors. » Ensuring compliance with the Noise Control Regulations

Mitigation: Action/control	Responsibility	Timeframe
Establish a line of communication and notify all stakeholders and potentially sensitive receptors of the means of registering any issues, complaints or comments.	ECO	All phases of project
Notify potentially sensitive receptors about work to take place at	Contractor, ECO	Duration of

Mitigation: Action/control	Responsibility	Timeframe
least 2 days before the activity in the vicinity (within 500 m) of the potentially sensitive receptors is to start. Following information to be presented in writing: » Description of activity to take place » Estimated duration of activity » Working hours » Contact details of responsible party		construction; At least 2 days, but not more than 5 days before activity is to commence
Ensure that all equipment is maintained and fitted with the required noise abatement equipment.	ECO	Weekly inspection
When any noise complaints are received, noise monitoring should be conducted at the complainant, followed by feedback regarding noise levels measured	Acoustical Consultant / Approved Noise Inspection Authority	Within 7 days after complaint was registered
The construction crew must abide by the local by-laws regarding noise.	Contractor, ECO	Duration of construction phase
Where possible construction work should be undertaken during normal working hours (06H00 – 22H00), from Monday to Saturday; If agreements can be reached (in writing) with the all the surrounding (within a 1,000 distance) potentially sensitive receptors, these working hours can be extended	Contractor	As required
All noisy construction operations should only occur during daylight hours in areas located close to noise sensitive receptors.	Contractor, ECO	Duration of construction phase

Performance Indicator	» Equivalent A-weighted noise levels below 45 dBA at potentially sensitive receptors (8 hours). » Ensure that maximum noise levels at potentially sensitive receptors are less than 65 dBA. » No noise complaints are registered
Monitoring	» Quarterly noise monitoring by an Acoustic Consultant or Approved Noise Inspection Authority. » Noise monitoring to be conducted downwind from all noisy activities or at potentially sensitive receptors when work is taking place within 1 000 meters from a potentially sensitive receptor. » Monitoring to take place every time that a noise complaint is registered.

OBJECTIVE: Management of dust and emissions to air

During the construction phase, limited gaseous or particulate emissions are anticipated from exhaust emissions from construction vehicles and equipment on-site, as well as vehicle entrained dust from the movement of vehicles on the main and internal access roads.

Project component/s	Construction and establishment activities associated with the wind energy facility and associated infrastructure.
Potential Impact	» Dust and particulates from vehicle movement to and on-site, foundation excavation, road construction activities, road maintenance activities, temporary stockpiles, and

	vegetation clearing affecting the surrounding residents and visibility. » Release of minor amounts of air pollutants (for example NO_2, CO and SO_2) from vehicles and construction equipment.
Activities/risk sources	» Clearing of vegetation and topsoil » Excavation, grading, scraping » Transport of materials, equipment and components on internal access roads » Re-entrainment of deposited dust by vehicle movements » Wind erosion from topsoil and spoil stockpiles and unsealed roads and surfaces » Fuel burning vehicle engines
Mitigation: Target/Objective	» To ensure emissions from all vehicles are minimised, where possible, for the duration of the construction phase » To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements for the duration of the construction phase

Mitigation: Action/control	**Responsibility**	**Timeframe**
Roads must be maintained to a manner that will ensure that dust from road or vehicle sources is not visibly excessive. Ensure that damage to roads is repaired on completion of construction phase.	Contractor	Site establishment; duration of construction
Appropriate dust suppressant must be applied on all exposed areas and stockpiles as required to minimise/control airborne dust.	Contractor	Duration of contract
Haul vehicles moving outside the construction site carrying material that can be wind-blown must be covered with tarpaulins.	Contractor	Duration of contract
Speed of construction vehicles must be restricted, as defined by the ECO.	Contractor	Duration of contract
Disturbed areas must be re-vegetated as soon as practicable once construction is completed in an area.	Contractor	At completion of construction phase
Construction vehicles and equipment must be maintained in a road-worthy condition at all times.	Contractor	Duration of contract
If monitoring results or complaints indicate inadequate performance against the criteria indicated, then the source of the problem must be identified, and existing procedures or equipment modified to ensure the problem is rectified.	Contractor	Duration of contract

Performance Indicator	» No complaints from affected residents or community regarding dust or vehicle emissions associated with construction activties. » Dust suppression measures on roads implemented for all areas that require such measures during the construction phase commences. » Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed. » Road worthy certificates in place for all heavy vehicles at outset of construction phase and up-dated on a monthly basis.
Monitoring	» Monitoring must be undertaken to ensure emissions are not exceeding the prescribed levels via the following methods: * Visual daily inspections of dust generation by construction activities throughout the construction phase. * Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Project Manager. * A complaints register must be maintained, in which any complaints from residents/the community will be logged. Complaints will be investigated and,

	where appropriate, acted upon. * An incident reporting system must be used to record non-conformances to the EMP.

OBJECTIVE: Management of impacts of the proposed facility on heritage resources and archaeological material

The main cause of impacts to archaeological and fossil material during construction activities is physical disturbance of the material itself and its context. The heritage and scientific potential of an archaeological site is highly dependent on its geological and spatial context. This means that even though, for example a deep excavation may expose archaeological artefacts, the artefacts are relatively meaningless once removed from the area in which they were found. Large-scale excavations for foundations will damage archaeological sites, as will road construction activities. Archaeological mitigation must take place prior to the start of construction.

If at any stage during the construction phase any semblance of a fossil is observed, it would be vital to stop the work immediately and report this occurrence to SAHRA and / or a professional palaeontologist as soon as possible so that appropriate mitigation measures can be implemented. Generally fossils can be removed quickly and would therefore not delay or hinder construction operations.

In the unlikely event that any concentrations of archaeological/fossil material or human remains are uncovered during further development of the site, all work must immediately cease and be should reported to the South African Heritage Resources Agency so that systematic and professional investigation/excavations can be undertaken. Sufficient time should be allowed to remove/collect such material.

Construction managers/foremen should be informed before the start of construction on the possible types of heritage sites and cultural material they may encounter and the correct procedures to follow when they encounter sites. It is suggested that one person be trained to be on site and report to the site manager when possible sites are encountered.

Project component/s	» Wind turbines » Access roads » Underground cabling ~~» Substation~~ ~~» Power line~~ » Associated infrastructure
Potential Impact	» Irreplaceable loss of the archaeological heritage and fossil material
Activity/risk source	» Site preparation and earthworks » Foundations or plant equipment installation » Mobile construction equipment movement on site ~~» Power line construction activities~~
Mitigation: Target/Objective	» To ensure that any heritage objects found on site are treated appropriately and in accordance with the relevant legislation

Mitigation: Action/control	Responsibility	Timeframe
Train ECO and construction personnel regarding identification of heritage sites	Archaeologist	Pre-construction
Report exposed human remains to Heritage Western Cape and SAHRA to guide on removal process for heritage artefacts.	HWC, SAHRA, heritage consultant authority/archaeologist/ ECO	Pre-construction
If at any stage during the construction phase any semblance of a fossil were to be observed, it would be vital to recover the fossil and report the occurrence to a heritage specialist.	Developer/ Contractor/ Appointed professional archaeologist/s in consultation with palaeontology Specialist/ ECO	Construction
If a heritage object is found any activities in that area must be stopped immediately, and appropriate specialists must be brought in to assess the site (photographs and GPS points must be recorded), the administering authority (Heritage Western Cape) of the item/site must be notified, and must undertake due/required processes. Where required the necessary and relevant permits must be obtained.	Developer/ Contractor/ appointed professional archaeologist/ ECO	Construction
Monitoring vegetation clearing and construction activities	Developer/Contractor/ appointed relevant professional archaeologist/ ECO	Construction

Performance Indicator	» Zero disturbance outside of designated work areas » All heritage/fossil material located are dealt with as per the legislative guidelines » A record is kept of all instances of accidental disturbance of heritage/fossil material, as well as post construction review of impacts on landscape context. » Compliance with the recommendations in the heritage report and Heritage Western Cape's Record of Decision (RoD) » Site visit, assessment report and recommendations to Heritage Western Cape in terms of archaeology and palaeontology
Monitoring	» Supervision of all clearing and earthworks by ECO and/or archaeologist throughout construction phase

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the construction of the Zen Wind Facility

The duration of the construction phase of the facility is dependent on the number of turbines being constructed, and is estimated at 2-3 days per turbine depending on local conditions. During the construction period, there will be a noticeable increase in heavy vehicles utilising the roads to the development site that may cause, at the very least, a visual nuisance to other road users and landowners in the area.

In this environment, dust from construction work is also likely to represent a significant visual impact.

Project component/s	» Wind turbines » Ancillary infrastructure (i.e. ~~substation, power line,~~ access roads, underground cables, etc.)
Potential Impact	» Visual impact of general construction activities, and the potential scarring of the landscape due to vegetation clearing.
Activity/risk source	» The viewing of the above mentioned by observers on or near the site.
Mitigation: Target/Objective	» Minimal visual intrusion by construction activities and intact vegetation cover outside of immediate works areas.

Mitigation: Action/control	Responsibility	Timeframe
Plan the placement of lay-down areas and temporary construction camps in order to minimise vegetation clearing.	Developer, Contractor	Construction
Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.	Developer, Contractor	Construction
Ensure that rubble, litter and disused construction materials are managed and removed regularly.	Developer, Contractor	Construction
Ensure that all infrastructure and the site and general surrounds are maintained in a neat and appealing way.	Developer, Contractor	Construction
Reduce and control construction dust through the use of approved dust suppression techniques.	Developer, Contractor	Construction
Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.	Developer, Contractor	Construction
Rehabilitate all disturbed areas, construction areas, road servitudes and cut and fill slopes to acceptable visual standards.	Developer, Contractor	Construction

Performance Indicator	» Vegetation cover on and in the vicinity of the site is intact with no evidence of degradation or erosion.
Monitoring	» Monitoring of vegetation clearing during construction. » Monitoring of rehabilitated areas post construction.

OBJECTIVE: Traffic management and transportation of equipment and materials to site (Refer to Appendix G)

The construction phase of the project will be the most significant in terms of generating traffic impacts; resulting from the transport of equipment (including turbine components) and materials and construction crews to the site and the return of the vehicles after delivery of materials. Potential impacts associated with transportation and access relate to works within the site boundary (i.e. the Wind Energy Facility and ancillary infrastructure) and external works outside the site boundary.

Project component/s	» Wind turbines » ~~Substations~~ » ~~Power line~~
Potential Impact	» Traffic congestion, particularly on narrow roads or on road passes where overtaking is not permitted

	» Risk of accidents » Deterioration of road pavement conditions (i.e. both surfaced and gravel road) due to abnormal loads
Activity/risk source	» Transportation of project components to site
Mitigation: Target/Objective	» To minimise impact of traffic associated with the construction of the facility on local traffic » To minimise potential for negative interaction between pedestrians or sensitive users and traffic associated with the facility construction

Mitigation: Action/control	**Responsibility**	**Timeframe**
Developer and implement a transportation/traffic management plan.	Contractor, Transportation contractor)	Duration of contract
All relevant permits for abnormal loads must be applied for from the relevant authority.	Contractor, Transportation contractor)	Duration of contract
A designated access (or accesses) to the proposed site must be created to ensure safe entry and exit.	Contractor	Duration of contract
Appropriate road management strategies must be implemented on external and internal roads with all employees and contractors required to abide by standard road and safety procedures.	Contractor, Transportation contractor)	Duration of contract
Any traffic delays because of construction traffic must be co-ordinated with the appropriate authorities.	Contractor	Duration of contract
Signage must be established at appropriate points warning of turning traffic and the construction site (all signage to be in accordance with prescribed standards).	Contractor	Duration of contract
Appropriate maintenance of all vehicles must be ensured.	Contractor	Duration of contract
All vehicles travelling on public roads must adhere to the specified speed limits and all drivers must be in possession of an appropriate valid driver's license.	Contractor	Duration of contract
Keep hard road surfaces as narrow as possible.	Contractor	Duration of contract
Utilise construction warning signage.	Contractor	Duration of contract

Performance Indicator	» No avoidable traffic incidents involving construction personnel » Appropriate signage in place » No complaints resulting from traffic congestion, delays or driver negligence associated with construction of the Wind Energy Facility
Monitoring	» Visual monitoring of dust produced by traffic movement » Visual monitoring of traffic control measures to ensure they are effective » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon » An incident reporting system will be used to record non-conformances to the EMP

OBJECTIVE: Appropriate handling and storage of chemicals, hazardous substances and waste (Refer to Appendix F

The construction phase of the Wind Energy Facility will involve the storage and handling of a variety of chemicals including adhesives, abrasives, oils and lubricants, paints and solvents. The main wastes expected to be generated by the construction of the facility will include general solid waste, hazardous waste and liquid waste. A guideline for integrated management of construction waste is included as Appendix E of this EMPr.

Project component/s	» Storage and handling of chemicals, hazardous substances and waste
Potential Impact	» Release of contaminated water from contact with spilled chemicals » Generation of contaminated wastes from used chemical containers » Inefficient use of resources resulting in excessive waste generation » Pollution of the surrounding environment through inappropriate waste management practices » Litter or contamination of the site or water through poor waste management practices » Pollution of water and soil resources
Activity/risk source	» Wind turbine construction activities ~~» Power line construction activities~~ ~~» Substation construction activities~~ » Packaging and other construction wastes » Hydrocarbon use and storage » Spoil material from excavation, earthworks and site preparation
Mitigation: Target/Objective	» To ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons » To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons » To comply with waste management guidelines developed by contractor » To minimise production of waste » To ensure appropriate waste handling, storage and disposal » To avoid environmental harm from waste disposal

Mitigation: Action/control	Responsibility	Timeframe
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	Contractor	Duration of contract
Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures.	Contractor	Duration of contract
In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents.	Contractor	Duration of contract
Spilled cement must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.	Contractor	Duration of contract
Soil contaminated/ polluted because of a major spill must be removed from the site and disposed of at a licensed hazardous waste disposal	Contractor	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
facility. Soils contaminated/ polluted through minor spills can be treated on site provided they are contained and have not penetrated the soil surface.		
Routine servicing and maintenance of vehicles must not take place on-site outside of designated areas (except for emergencies or large cranes which cannot be moved off-site). If repairs of vehicles must take place on site, an appropriate drip tray must be used to contain any fuel or oils.	Contractor	Duration of contract
All stored fuels to be maintained within a bunded area and on a sealed surface.	Contractor	Duration of contract
Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function.	Contractor ECO	Duration of contract
Construction machinery must be stored in an appropriately sealed area.	Contractor	Duration of contract
~~Oily water from bunds at the substations must be removed from site by licensed contractors.~~	~~Contractor~~	~~Duration of contract~~
The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately bunded, and stored in compliance with MSDS files.	Contractor	Duration of contract
Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals will be compiled with.	Contractor	Duration of contract
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations.	Contractor	Duration of contract
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	Contractor	Pre-construction
Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap), and contaminated waste. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control.	Contractor	Duration of contract
Where possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation, and storage of waste streams (such as wood, metals, general refuse etc.).	Contractor	Duration of contract
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor	Duration of contract
No waste may be buried or burnt on site	Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area.	Contractor	Duration of contract
Waste and surplus dangerous goods must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal.	Contractor	Duration of contract
Documentation (waste manifest) must be maintained detailing the quantity, nature, and fate of any regulated waste. Waste disposal records must be available for review at any time.	Contractor	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage. This must include precautionary measures to limit he possibility of oil and other toxic liquids from entering the soil or storm water systems.	Contractor	Duration of contract
Dispose of all solid waste collected at an appropriately registered waste disposal site. The disposal of waste shall be in accordance with all relevant legislation. Under no circumstances may waste be burnt on site.	Contractor	Duration of contract
Where a registered waste site is not available close to the construction site, provide a method statement with regard to waste management.	Contractor	Pre-construction
Upon the completion of construction, the area must be cleared of potentially polluting materials.	Contractor	Completion of construction

Performance Indicator	» No chemical spills outside of designated storage areas » No water or soil contamination by spills » No complaints received regarding waste on site or indiscriminate dumping » Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately » Provision of all appropriate waste manifests for all waste streams
Monitoring	» Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase » A complaints register must be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon » Observation and supervision of waste management practices throughout construction phase » Waste collection to be monitored on a regular basis » Waste documentation completed » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon » An incident reporting system will be used to record non-conformances to the EMPr

OBJECTIVE: Effective management of concrete batching plants (if required)

A considerable amount of concrete is required during the construction of a wind energy facility. In this regard there could be a need to establish a batching plant within the site. Batching plants are facilities/installations that combine various ingredients to form concrete. Some of these inputs include sand, water, aggregate (rocks, gravel, etc.), fly ash, potash, and cement.

Turbid and highly alkaline wastewater, dust emissions and noise are the key potential impacts associated with concrete batching plants. Concrete batching plants, cement, sand and aggregates can produce dust. Potential pollutants in batching plant wastewater and stormwater include cement, sand, aggregates, chemical additive mixtures, fuels and lubricants.

Project component/s	» Batching plant and associated activities

Potential Impact	» Dust emissions » Release of contaminated water » Generation of contaminated wastes from used chemical containers » Inefficient use of resources resulting in excessive waste generation
Activity/risk source	» Operation of the batching plant » Packaging and other construction wastes » Hydrocarbon use and storage » Spoil material from excavation, earthworks and site preparation
Mitigation: Target/Objective	» To ensure that the operation of the batching plant does not cause pollution to the environment or harm to persons

Mitigation: Action/control	Responsibility	Timeframe
Where possible concrete batching plants should be sited such that impacts on the environment or the amenity of the local community from noise, odour or polluting emissions are minimised.	Contractor	Construction phase
The provision of natural or artificial wind barriers such as trees, fences and landforms may help control the emission of dust from the plant.	Contractor	Construction phase
Where there is a regular movement of vehicles. Access and exit routes for heavy transport vehicles should be planned to minimise noise and dust impacts on the environment.	Contractor	Construction phase
The concrete batching plant site should demonstrate good maintenance practices.	Contractor	Construction phase
The prevailing wind direction should be considered to ensure that bunkers and conveyors are sited in a sheltered position to minimise the effects of the wind.	Contractor	Construction phase
Aggregate material should be delivered in a damp condition, and water sprays or a dust suppression agent should be correctly applied to reduce dust emissions and reduce water usage.	Contractor	Construction phase
Conveyors must be designed and constructed to prevent fugitive dust emissions. This may include installing side protection barriers and equipping the conveyor with spill trays, which direct material to a collection point. Belt cleaning devices at the conveyor head may also assist to reduce spillage.	Contractor	Construction phase
The site should be designed and constructed such that clean stormwater, including roof runoff, is diverted away from contaminated areas and directed to the stormwater discharge system.	Contractor	Construction phase
Any liquids stored on site, including admixtures, fuels and lubricants, should be stored in accordance with applicable legislation	Contractor	Construction phase
Contaminated stormwater and process wastewater should be captured and recycled where possible. A wastewater collection and recycling system should be designed to collect contaminated water.	Contractor	Construction phase
Process wastewater and contaminated stormwater collected from the entire site should be diverted to a settling pond, or series of ponds, such that the water can be reused in the concrete batching process. The settling pond or series of ponds should be lined with an impervious liner capable of containing all	Contractor	Construction phase

Mitigation: Action/control	Responsibility	Timeframe
contaminants found within the water they are designed to collect		
Areas where spills of oils and chemicals may occur should be equipped with easily accessible spill control kits to assist in prompt and effective spill control	Contractor	Construction phase
Ensure that all practicable steps are taken to minimise the adverse effect that noise emissions. This responsibility includes not only the noise emitted from the plant and equipment but also associated noise sources, such as radios, loudspeakers and alarms	Contractor	Construction phase
Where possible, waste concrete should be used for construction purposes at the batching plant or project site.	Contractor	Construction phase
The batching plant should be monitored by the ECO to ensure that the plant is operating according to its environmental objectives and within legislative requirements.	ECO	Construction phase

Performance Indicator	» No complaints on dust » No water or soil contamination by chemical spills » No complaints received regarding waste on site or indiscriminate dumping
Monitoring	» Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon » An incident reporting system will be used to record non-conformances to the EMPr » FE Bonne Esperance (Pty) Ltd or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase

OBJECTIVE: Ensure disciplined conduct of on-site contractors and workers

In order to minimise impacts on the surrounding environment, Contractors must be required to adopt a certain Code of Conduct and commit to restricting construction activities to areas within the development footprint. Contractors and their sub-contractors must be familiar with the conditions of the Environmental Authorisation (once issued), the EIA Report, and this EMPr, as well as the requirements of all relevant environmental legislation.

Project component/s	» Wind turbines » Access roads » ~~Substation~~ » ~~Power line~~
Potential Impact	» Pollution/contamination of the environment » Disturbance to the environment
Activity/risk source	» Contractors are not aware of the requirements of the EMP, leading to unnecessary impacts on the surrounding environment

Mitigation: Target/Objective	» To ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment

Mitigation: Action/control	Responsibility	Timeframe
The terms of this EMPr and the Environmental Authorisation (once issued) must be included in all tender documentation and Contractors contracts.	Developer	Tender process
An ECO must be permanently on site throughout the road construction, cable laying, and turbine foundation excavation periods.	Developer	Duration of construction
Contractors must use chemical toilets/ablution facilities situated at designated areas of the site; no ablution will be permitted outside the designated area. These facilities must be regularly cleaned, sanitised, emptied and serviced by the appropriate contractors. Sewage must be disposed of at an approved wastewater treatment site and may under no circumstances be dumped in the bush or buried.	Contractor (and sub-contractor/s)	Duration of contract
Cooking/meals must take place in a designated area; no firewood or kindling may be gathered from the site or surrounds.	Contractor (and sub-contractor/s)	Duration of contract
All litter must be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area; particular attention needs to be paid to food waste.	Contractor (and sub-contractor/s)	Duration of contract
No one other than the ECO or personnel authorised by the ECO must disturb flora or fauna outside of the demarcated construction area/s.	Contractor (and sub-contractor/s)	Duration of contract
Contractors appointed by FE Bonne Esperance (Pty) Ltd 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.	Contractor (and sub-contractor/s)	Construction
On completion of the construction phase all construction workers must be transported back to their place of origin within two days of their contract ending. The costs of transportation must be borne by the contractor	Contractor (and sub-contractor/s)	Construction

Performance Indicator	» Compliance with specified conditions of Environmental Authorisation, EIA report and EMPr » No complaints regarding contractor behaviour or habits » Code of Conduct implemented before commencement of construction phase. » Briefing session with construction workers held at outset of construction phase
Monitoring	» Observation and supervision of Contractor practices throughout construction phase. » A complaints register must be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon » An incident reporting system will be used to record non-conformances to the EMPr

5.4. Detailing Method Statements

OBJECTIVE: To ensure all construction activities/practices/procedures are undertaken with the appropriate level of environmental awareness to minimise environmental risk, in line with the specifications of the EMPr

The environmental specifications are required to be underpinned by a series of Method Statements, within which the Contractors and Service Providers are required to outline how any identified environmental risks will practically be mitigated and managed for the duration of the contract, and how specifications within this EMPr will be met. That is, the Contractor will be required to describe how specified requirements will be achieved through the submission of written Method Statements to the Site Manager (and ECO).

A Method Statement is defined as "a written submission by the Contractor in response to the environmental specification or a request by the Site Manager, setting out the plant, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the Site Manager is able to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications". The Method Statement must cover applicable details with regard to:

- Construction procedures, from site preparation to completion.
- Site access
- Materials and equipment to be used
- Getting the equipment to and from site
- How the equipment/material will be moved while on-site
- How and where material will be stored
- The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur
- Timing and location of activities
- Compliance/non-compliance with the Specifications, and
- Any other information deemed necessary by the Site Manager.

Specific areas to be addressed in the method statement: pre, during and post construction include:

- Site establishment (which explains all activities from induction training to offloading, construction sequence for site establishment and the different amenities and to be established etc. Including a site camp plan indicating all of these).
- Preparation of the site (i.e. Clearing vegetation, compacting soils and removing existing infrastructure and waste).
- Soil management/stockpiling and erosion control.
- Excavations and backfilling procedure.
- Stipulate norms and standards for water supply and usage (i.e.: comply strictly to licence and legislation requirements and restrictions)
- Stipulate the storm water management procedures recommended in the storm water management method statement.
- Ablution facilities (placement, maintenance, management and servicing)
- Solid Waste Management:

- Description of the waste storage facilities (on site and accumulative).
- Placement of waste stored (on site and accumulative).
- Management and collection of waste process.
- Recycle, re-use and removal process and procedure.

» Liquid waste management:
- The design, establish, maintain and operate suitable pollution control facilities necessary to prevent discharge of water containing polluting matter or visible suspended materials into rivers, streams or existing drainage systems.
- Should grey water (i.e. water from basins, showers, baths, kitchen sinks etc.) need to be disposed of, link into an existing facilities where possible. Where no facilities are available, grey water runoff must be controlled to ensure there is no seepage into wetlands or natural watercourses.

» Dust and noise pollution
- Describe necessary measures to ensure that noise from construction activities is maintained within lawfully acceptable levels (construction activities generating output levels of 85 dB(A) near human settlement, are to be confined to working hours (08h00 - 17h00) Mondays to Fridays).
- Procedure to control dust at all times on the site, access roads, borrow pits and spoil sites (dust control shall be sufficient so as not to have significant impacts in terms of the biophysical and social environments). These impacts include visual pollution, decreased safety due to reduced visibility, negative effects on human health and the ecology due to dust particle accumulation.

» Hazardous substance storage (Ensure compliance with all national, regional and local legislation with regard to the storage of oils, fuels, lubricants, solvents, wood treatments, bitumen, cement, pesticides and any other harmful and hazardous substances and materials. South African National Standards apply).
- Lists of all potentially hazardous substances to be used.
- Appropriate handling, storage and disposal procedures.
- Prevention protocol of accidental contamination of soil at storage and handling areas.
- All storage areas, (ie: for harmful substances appropriately bunded with a suitable collection point for accidental spills must be implemented and drip trays underneath dispensing mechanisms including leaking engines/ machinery).

» Fire prevention and management measures on site.

» Fauna and flora protection process on and off site (ie removal to reintroduction or replanting, if necessary).
- Rehabilitation and re-vegetation process.

» Incident and accident reporting protocol.

» General administration

» Designate access road and the protocol on while roads are in use.

» Requirements on gate control protocols.

The Contractor may not commence the activity covered by the Method Statement until it has been approved by the Site Manager, except in the case of emergency activities and then only with the consent of the Site Manager. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract.

Failure to submit a method statement may result in suspension of the activity concerned until such time as a method statement has been submitted and approved. The ECO should monitor the construction activities to ensure that these are undertaken in accordance with the approved Method Statement.

5.5. Awareness and Competence: Construction Phase of the Wind Energy Facility

OBJECTIVE: To ensure all construction personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm

To achieve effective environmental management, it is important that Contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMPr. The Contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The Contractors obligations in this regard include the following:

- Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment.
- Ensuring that a copy of the EMPr is readily available on-site, and that all site staff are aware of the location and have access to the document. Employees will be familiar with the requirements of the EMPr and the environmental specifications as they apply to the construction of the facility.
- Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training course. The course must provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
- Basic training in the identification of archaeological sites/objects, paleontological sites, and protected flora and fauna that may be encountered on the site.
- Awareness of any other environmental matters, which are deemed necessary by the ECO.
- Ensuring that appropriate communication tools are used to outline the environmental "do's" and "don'ts" (as per the environmental awareness training course) to employees.
- Records must be kept of those that have completed the relevant training.
- Refresher sessions must be held to ensure the contractor's staff are aware of their environmental obligations.

Therefore, prior to the commencement of construction activities on site and before any person commences with work on site thereafter, adequate environmental awareness and responsibility are to be appropriately presented to all staff present onsite, clearly describing their obligations towards environmental controls and methodologies in terms of this EMPr. This training and awareness will be achieved in the following ways:

5.5.1. Environmental Awareness Training

Environmental Awareness Training must take the form of an on-site talk and demonstration by the EO or responsible personnel before the commencement of site establishment and construction on site. The education/awareness programme should be aimed at all levels of management and construction workers within the contractor team. A record of attendance of this training must be maintained by the EO or responsible on site.

5.5.2. Induction Training

Environmental induction training must be presented to all persons who are to work on the site – be it for short or long durations; Contractor's or Engineer's staff; administrative or site staff; sub-contractors or visitors to site.

This induction training should include discussing the developer's environmental policy and values, the function of the EMPr and Contract Specifications and the importance and reasons for compliance to these. The induction training must highlight overall do's and don'ts on site and clarify the repercussions of not complying with these. The non-conformance reporting system must be explained during the induction as well. Opportunity for questions and clarifications must form part of this training. A record of attendance of this training must be maintained by the SHE Officer on site.

5.5.3. Toolbox Talks

Toolbox talks should be held on a scheduled and regular basis (at least twice a month) where foremen, environmental and safety representatives of different components of the Works and sub-consultants hold talks relating to environmental practices and safety awareness on site. These talks should also include discussions on possible common incidents occurring on site and the prevention of reoccurrence thereof. Records of attendance and the awareness talk subject must be kept on file.

5.6. Monitoring Programme: Construction Phase of the Wind Energy Facility

OBJECTIVE: To monitor the performance of the control strategies employed against environmental objectives and standards

A monitoring programme must be in place not only to ensure conformance with the EMPr, but also to monitor any environmental issues and impacts which have not been accounted for in the EMPr that are, or could result in significant environmental impacts for which corrective action is required. The period and frequency of monitoring will be stipulated by the Environmental Authorisation (once issued). Where this is not clearly dictated, FE Bonne Esperance (Pty) Ltd will determine and stipulate the period and frequency of monitoring required in consultation with relevant stakeholders and authorities. The Project Manager will ensure that the monitoring is conducted and reported.

The aim of the monitoring and auditing process would be to routinely monitor the implementation of the specified environmental specifications, in order to:

- Monitor and audit compliance with the prescriptive and procedural terms of the environmental specifications
- Ensure adequate and appropriate interventions to address non-compliance
- Ensure adequate and appropriate interventions to address environmental degradation
- Provide a mechanism for the lodging and resolution of public complaints
- Ensure appropriate and adequate record keeping related to environmental compliance

- Determine the effectiveness of the environmental specifications and recommend the requisite changes and updates based on audit outcomes, in order to enhance the efficacy of environmental management on site
- Aid communication and feedback to authorities and stakeholders.

The ECO will ensure compliance with the EMPr, and to conduct monitoring activities. The ECO must have the appropriate experience and qualifications to undertake the necessary tasks. The ECO will report any non-compliance or where corrective action is necessary to the Site Manager and/or any other monitoring body stipulated by the regulating authorities.

The following reports will be applicable:

5.6.1. Non-Conformance Reports

All supervisory staff including Foremen, Resident Engineers, and the ECO must be provided the means to be able to submit non-conformance reports to the Site Manager. Non-conformance reports will describe, in detail, the cause, nature and effects of any environmental non-conformance by the Contractor. Records of penalties imposed may be required by the relevant authority within 48 (forty eight) hours.

The non-conformance report will be updated on completion of the corrective measures indicated on the finding sheet. The report must indicate that the remediation measures have been implemented timeously and that the non-conformance can be closed-out to the satisfaction of the Site Manager and ECO.

5.6.2. Monitoring Reports

A monitoring report will be compiled by the ECO on a monthly basis and must be submitted to DEA for their records. This report should include details of the activities undertaken in the reporting period, any non-conformances or incidents recorded, corrective action required, and details of those non-conformances or incidents which have been closed out.

5.6.3. Final Audit Report

A final environmental audit report must be compiled by an independent auditor and be submitted to DEA upon completion of the construction and rehabilitation activities (within 30 days of completion of the construction phase (i.e.: within 30 days of site handover) and within 30 days of completion of rehabilitation activities. This report 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 and the requirements of the EMPr.

7 MANAGEMENT PROGRAMME FOR WIND ENERGY FACILITY: REHABILITATION OF DISTURBED AREAS

6.1. Overall Goal for the Rehabilitation of Disturbed Areas

Overall Goal for the Rehabilitation of Disturbed Areas: Undertake the rehabilitation measures in a way that:

» Ensures rehabilitation of disturbed areas following the execution of the works, such that residual environmental impacts are remediated or curtailed

6.2. Objectives

In order to meet this goal, the following objective, actions and monitoring requirements are relevant:

OBJECTIVE: To ensure appropriate rehabilitation of disturbed areas following the execution of the works, such that residual environmental impacts are remediated or curtailed

Areas requiring rehabilitation will include all areas disturbed during the construction phase and that are not required for regular maintenance operations. Rehabilitation should be undertaken in an area as soon as possible after the completion of construction activities within that area.

The main areas requiring rehabilitation will be the laydown areas adjacent to the turbines, the crane tracks alongside the permanent access roads, any cable routings where these fall outside the above-mentioned areas, and other disturbed areas.

Project component/s	» Wind Energy Facility (including laydown areas) ~~» Power line servitude and associated service roads~~ ~~» Substation site and associated access road~~ » Access roads not required for operation and maintenance
Potential Impact	» Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention.
Activity/risk source	» Temporary laydown areas » Temporary access roads/tracks » Other disturbed areas/footprints
Mitigation: Target/Objective	» To ensure and encourage site rehabilitation of disturbed areas » To ensure that the site is appropriately rehabilitated following the execution of the works, such that residual environmental impacts (including erosion) are remediated or curtailed

Mitigation: Action/control	Responsibility	Timeframe
All temporary facilities, equipment, and waste materials must be removed from site as soon as practically possible after construction is complete.	Contractor	Following execution of works
All areas are to be cleared of rubble and construction waste	Contractor	Following the

Mitigation: Action/control	Responsibility	Timeframe
ruminants. This includes the removal of excess materials, which includes excavation and disposal of concrete and concrete wash water, and all the waste related thereto.		excavation of works.
All soil contaminated by hydrocarbons is to be excavated to the depth of contaminant penetration, removed and transported to an appropriate registered landfill site.	Contractor	Completion of construction activities in an area
All temporary fencing and danger tape must be removed once the construction phase has been completed.	Contractor	Completion of construction activities in an area
Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion.	Contractor	Completion of construction activities in an area
The topography of the area must be restored, as far as possible, to the natural state of the area.	Contractor	Completion of construction activities in an area
Drainage lines affected by construction are to be rehabilitated to the approximate original profile. I f rehabilitation of the drainage line is not possible the profile is to be agreed upon by the ECO and Principal Agent/Engineer.	Contractor	Completion of construction activities in an area
All compacted disturbed areas are to be tilled, following the landscapes contours to a depth of 150 mm before replacement of topsoil (except where otherwise specified in the EMPr).	Contractor	Completion of construction activities in an area
Topsoil is to be re-placed consistent with the surrounding natural environment and remain un compacted.	Contractor	Completion of construction activities in an area.
All areas of disturbed soil must be reclaimed using only indigenous grass and shrubs. Reclamation activities should be undertaken as early as possible on disturbed areas.	Contractor	Completion of construction activities in an area
No exotic plants may be used for rehabilitation purposes; only indigenous plants from the area may be utilised (preferably within 50km radius of the site). No chemical based fertilizers and compost may be used.	Contractor	Completion of construction activities in an area
Topsoil stored for longer than 6 months, must be vegetated. In cases like this, the biological viability of topsoil stockpiles shall be tested before placement during rehabilitation and where necessary amelioration such as microbial supplementation may be required.	Contractor	Completion of construction activities in an area
Replacement of soil types must be done so as to match the baseline soil profile as closely as possible.	Contractor	Completion of construction activities in an area
The seed mix for use in rehabilitation must be an approved mix of indigenous grass species common to the area.	Contractor	Prior to the start of rehabilitation
Seeding operations must coincide with rainfall events or as part of a managed watering schedule	Contractor	Completion of construction activities in an area

Performance Indicator	» All portions of site, including construction equipment camp and working areas, cleared of equipment and temporary facilities

	» Topsoil replaced on all areas and stabilised » Disturbed areas rehabilitated and acceptable plant cover achieved on rehabilitated sites » Completed site free of erosion and alien invasive plants
Monitoring	» On-going inspection of rehabilitated areas in order to determine effectiveness of rehabilitation measures implemented. » On-going alien plant monitoring and removal should be undertaken on an annual basis for the life of facility. » Botanist to monitor rehabilitation every two years after first sowing.

8 MANAGEMENT PROGRAMME FOR WIND ENERGY FACILITY: OPERATION

7.1. Overall Goal for Operation

Overall Goal for Operation: To ensure that the operation of the Wind Energy Facility does not have unforeseen impacts on the environment and to ensure that all impacts are monitored and the necessary corrective action taken in all cases. In order to address this goal, it is necessary to operate the Wind Energy Facility in a way that:

- Ensures that operation activities are properly managed in respect of environmental aspects and impacts.
- Enables the Wind Energy Facility operation activities to be undertaken without significant disruption to other land uses in the area, in particular with regard to noise impacts, farming practices, traffic and road use, and effects on local residents.
- Minimises impacts on birds and other fauna using the site.
- Monitors and evaluates the impacts of the Wind Energy Facility on birds and bats that frequent the area, in particular monitoring of bird and bat strikes, bird nesting and bat roosting activities and water bird uses of the water bodies on the site.
- Monitors the actual noise impacts of the Wind Energy Facility.
- Establishes an environmental baseline for Wind Energy Facility sites in South Africa, particularly with regard to priority bird species using the site.

7.2. Objectives

In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

OBJECTIVE: Limit impacts on bats

Bats have been found to be particularly vulnerable to being killed by wind turbines. It has long been a mystery why they should be so badly affected since bat echo-location allows them to detect moving objects very well. A recent study in America has found that the primary cause for mortality is a combination of direct strikes and barotrauma (bats are killed when suddenly passing through a low air pressure region surrounding the turbine blade tips causing low pressure damage the bat's lungs).

Bats are most vulnerable when leaving and returning to their roosts, usually at sunset and sunrise. This is also the time of the day (usually) when there is the least wind. The bat monitoring programme implemented prior to the commencement of construction will identify whether threatened / near threatened species occur on site or not and when they are most active. The most vulnerable species are those that are already classified as threatened species, including those classified as critically endangered, endangered or vulnerable.

By considering the results from the bat surveys and the species recorded, selected sensitive areas for bats, including the mountain area, the river and water bodies, and roosts must be safe guarded. It is important

to safeguard the Roodesandberge mountain range, where recorded individuals of the *Molossidae* family were recorded nearby, possibly roosting in the crevices.

Project component/s	Wind turbines
Potential Impact	Loss of individuals of the near threatened bat species
Activity/risk source	Operation
Mitigation: Target/Objective	Limited bat mortalities within project control area

Mitigation: Action/control	Responsibility	Timeframe
A bat monitoring program in the operational phase should be implemented in order to determine the actual impacts of the wind energy facility on the bat community.	Developer in consultation with specialist	Operation
Minimal lighting for the wind farm to be used.	Developer	Operation
Utilization of red lights in the turbines, instead of white, in order to minimize insect attraction and bat foraging behaviours near the turbines.	Developer	Operation
Intensify the opportunity for foraging in areas where turbines are not located.	Developer	Operation
Land management practices beneath the turbines should ideally not attract bat species vulnerable to collision (e.g. open air-foragers or clutter-edge foragers).	Developer	Operation
Cereal plantations should be limited in the surrounding of the wind turbines to reduce the suitability of the areas for bat foragers.	Developer	Operation
Develop and implement a post-construction bat monitoring programme which includes carcass searches for bats during the first two years of operation, to be fully compliant with Aronson et al. (2020). Should post- construction fatality monitoring reveal high levels of fatality, automated real-time bat monitoring and analysis systems are recommended as the primary method for automated and near-real-time bat fatality mitigation	Developer EPC Contractor	Operation
Post-construction bat monitoring must take place and must be fully compliant with Aronson et al. (2020)".	Developer EPC Contractor	Operation

Performance Indicator	Number of individual mortalities from collision with wind turbines
Monitoring	» Determine densities of bat species within the area before and after construction » Document patterns of bat movement in the vicinity » Record bat mortalities and, as far as possible, the circumstances surrounding collisions. Standard protocols should be used when undertaking such surveys

OBJECTIVE: Limit impacts on birds

Impacts on birds during the operation of the wind energy facility including collisions with turbines.

Project component/s	» Wind turbines » ~~Power line~~
Potential Impact	» Loss of individuals of the near threatened bird species » Disturbance to or loss of birds as a result of collision with the turbine blades and » ~~Electrocution on power lines and substations~~
Activity/risk source	» Operation of wind turbines » ~~Disturbance to or loss of birds as a result of collision with the overhead power line~~
Mitigation: Target/Objective	Limited bird mortalities within project control area

Mitigation: Action/control	Responsibility	Timeframe
On-going bird monitoring during operation.	Developer in consultation with specialist	Operation
Ensuring that all new power lines are marked with bird flight diverters from origin to destination (with marker and fitting standards as per the industry standard)	Developer Environmental Manager	Construction - operation
Bird diverter devices spaced at 1 m intervals along the line (as the flight line is narrow) where it crosses any rivers. The devices used must have nocturnal illumination	Developer Environmental Manager	Construction - operation
Review monitoring report on the full year of post-construction monitoring, and integrate findings into operational EMPr and broader mitigation scheme	Advising scientist, monitoring agency and radar specialist (if applicable), in negotiation with the client	1 year post-construction
Conduct operational phase bird monitoring in accordance with the relevant and applicable Best Practice Guidelines as available at that time (and may include species specific guidelines).	Developer in consultation with specialist	Operation

Performance Indicator	Number of individual mortalities from collision with wind turbines
Monitoring	» Determine densities of bird species within the area before and after construction » Document patterns of bird movement in the vicinity » Record bird mortalities and, as far as possible, the circumstances surrounding collisions. Standard protocols should be used when undertaking such surveys

OBJECTIVE: Protection of vegetation

Project component/s	» Wind turbines » Access roads and crane hardstand areas. » All other associated infrastructure. » ~~Substation linking the facility to the electricity grid~~ » Underground cabling

	» ~~Power line~~
Potential Impact	» Disturbance of vegetation outside of areas affected by wind energy facility components
Activity/risk source	» Maintenance of wind energy facility and associated infrastructure
Mitigation: Target/Objective	» Minimisation of impacts on vegetation in the area surrounding the wind energy facility infrastructure

Mitigation: Action/control	**Responsibility**	**Timeframe**
Limit maintenance activities to facility footprint.	Developer	Operational Life of the Facility
Only utilise existing roads.	Developer	Operational Life of the Facility
Alien invasive management to be implemented during operation of the facility. The management strategy must include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and' removal of alien species is undertaken.	Developer	Operational Life of the Facility
Use erosion control measures, should erosion arise during the operational life of the facility.	Developer	Operational Life of the Facility

Performance Indicator	» Minimal impacts on vegetation outside of facility footprint
Monitoring	» On-going monitoring of area by environmental manager. » Annual audit of project area and immediate surroundings by qualified botanist. » If any alien invasive species are detected then the distribution of these should be mapped (GPS co-ordinates of plants or concentrations of plants), number of individuals (whole site or per unit area), age and/or size classes of plants and aerial cover of plants. » The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the project area and used in optimising the control programme. » The environmental manager should be responsible for driving this process. » Reporting frequency depends on legal compliance framework..

OBJECTIVE: Appropriate handling and management of hazardous substances and waste

The operation of the Wind Energy Facility will involve the generation of limited waste products. The main wastes expected to be generated by the operation activities includes general solid waste, hazardous waste and liquid waste.

Project component/s	» Wind turbines » ~~Substation~~ » ~~Power line~~
Potential Impact	» Inefficient use of resources resulting in excessive waste generation » Litter or contamination of the site or water through poor waste management practices
Activity/risk source	» Generators and gearbox - turbines » ~~Transformers and switchgear - substation~~

	» Fuel and oil storage » Maintenance building
Mitigation: Target/Objective	» To comply with waste management guidelines » To minimise production of waste » To ensure appropriate waste disposal » To avoid environmental harm from waste disposal

Mitigation: Action/control	Responsibility	Timeframe
Hazardous substances must be stored in sealed containers within a clearly demarcated designated area.	Developer	Operation
Storage areas for hazardous substances must be appropriately sealed and bunded.	Developer	Operation
All structures and/or components replaced during maintenance activities must be appropriately disposed of at an appropriately licensed waste disposal site or sold to a recycling merchant for recycling.	Developer	Operation
Care must be taken to ensure that spillage of oils and other hazardous substances are limited during maintenance. Handling of these materials should take place within an appropriately sealed and bunded area. Should any accidental spillage take place, it will be cleaned up according to specified standards regarding bioremediation.	Developer	Operation, maintenance
Waste handling, collection, and disposal operations must be managed and controlled by a waste management contractor.	Developer /waste management contractor	Operation
Used oils and chemicals: » Appropriate disposal must be arranged with a licensed facility in consultation with the administering authority. » Waste must be stored and handled according to the relevant legislation and regulations.	Developer	Operation
It must be ensured that volumes of any hazardous waste stored on site do not exceed 30m^3. Should this volume be exceeded, a waste license will be required to be obtained.	Developer	Operation
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	Developer	Operation
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.	Developer	Operation
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Developer	Operation

Performance Indicator	» No complaints received regarding waste on site or indiscriminate dumping » Internal site audits identifying that waste segregation recycling and reuse is occurring appropriately » Provision of all appropriate waste manifests » No contamination of soil or water
Monitoring	» Waste collection must be monitored on a regular basis· » Waste documentation must be completed and available for inspection on request » An incidents/complaints register must be maintained, in which any complaints from the community must be logged. Complaints must be investigated and, if

	appropriate, acted upon » Regular reports on exact quantities of all waste streams exiting the site must be compiled by the waste management contractor and monitored by the SHE Representative. All appropriate waste disposal certificates accompany the monthly reports.

OBJECTIVE: Noise control

The resulting future noise projections indicated that the operation of the facility would comply with the Noise Control Regulations (GN R154) as well as the guidelines as proposed by SANS 10103:2008 during periods when the wind speeds are less than 6 m/s. The significance of this noise impact was determined to be low. Mitigation measures, however, are proposed to ensure that the potential noise impacts and risks be optimally minimised.

The following measures are recommended to define the performance of the developer in mitigating the projected impacts and reducing the significance of the noise impact.

Project Component(s)	Wind turbines
Potential Impact	» Increased noise levels at potentially sensitive receptors » Changing ambient sound levels could change the acceptable land use capability » Disturbing character of sound
Activity/Risk source	» Simultaneous operation of a number of turbines
Mitigation Target/Objective	» Ensure that the change in ambient sound levels as experienced by potentially sensitive receptors is less than 5 dBA » Prevent the generation of nuisance noises » Ensure acceptable noise levels at surrounding stakeholders and potentially sensitive receptors

Mitigation: Action/control	Responsibility	Timeframe
Design and implement a noise monitoring programme.	Acoustical Consultant / Approved Noise Inspection Authority	Before operational phase commence
Quarterly noise measurements to be undertaken for the first year of operation of the facility.	Acoustical Consultant / Approved Noise Inspection Authority	Operational phase: quarterly
Add additional noise monitoring points at any complainants that registered a noise complaint relating to the operation of the wind energy facility	Acoustical Consultant / Approved Noise Inspection Authority	With quarterly monitoring
Ensure that mobile heavy equipment is well maintained and fitted with the correct and appropriate noise abatement measures. Engine bay covers over heavy equipment could be pre-fitted with sound absorbing material. Heavy equipment that fully encloses the engine bay should be considered, ensuring that the seam gap between the hood and vehicle body is minimised;	ECO	Operational phase
Include a component covering environmental noise in the	ECO	Operational phase

Mitigation: Action/control	Responsibility	Timeframe
Health and Safety Induction to sensitize all employees and contractors about the potential impact from noise, especially those employees and contractors that have to travel past receptors at night, or might be required to do work close (within 1,000m) to NSR at night. This should include issues such as minimising the use of vehicle horns;		
Where practicable, mobile equipment should be fitted with broadband (white-noise generators/alarms 34 35), rather than tonal reverse alarms.	Developer	Operational phase

Performance Indicator	» Ensure that the change in ambient sound levels as experienced by potentially sensitive receptors is less than 7 dBA.
Monitoring	» Quarterly noise monitoring by an Acoustic Consultant or Approved Noise Inspection Authority for the first year of operation. Monitoring should take place over a 24 hour period in 10 minute bins, with the results co-ordinated with the 10 m wind speed. Noise monitoring programme to be developed and implemented at the start of operation.

OBJECTIVE: Maximise local employment and business opportunities associated with the operation phase

The establishment of the wind energy facility will create ~7 permanent and ~9 temporary employment opportunities. The operational phase is expected to extend over a period of 20 years. The employment opportunities are therefore limited. Therefore, long-term direct job opportunities for locals exist, although limited. However, in an area with such high unemployment figures, these limited opportunities should still be seen as a positive impact on the quality of life of those benefiting from the employment.

Some local procurement of goods, materials and services could occur which would result in positive economic spin-offs. These opportunities for local service providers to render services to the facility could include maintenance of the guardhouse, gardening at the guardhouse, cleaning services, security services and maintenance or replacement of general equipment.

Project component/s	Operation and maintenance of the facility
Potential Impact	The opportunities and benefits associated with the creation of local employment and business should be maximised
Activities/risk sources	Locals are not employed where the local skills exist Local procurement is not undertaken if possible Local businesses are not supported
Mitigation: Target/Objective	Maximise the appointment of local employees

Mitigation: Action/control	Responsibility	Timeframe
Contractors should capacitate locals where practical	Project proponent Contractor	Pre-operation and Operation
The project proponent should consider training and capacity building programmes to lessen the skills disparity	Project proponent	Operation

Mitigation: Action/control	Responsibility	Timeframe
The skill requirements should be communicated to the local community leaders and community based organisations	Project proponent	Operation
Make use of local recruitment agencies or other relevant community based organisations to obtain a list of jobseekers	Project proponent	Operation
An equitable process whereby minorities and previously disadvantaged individuals (women) are taken into account should be implemented.	Project proponent	Operation
Local sourcing of materials and general services to assist in providing more economic and employment opportunities for the local people	Project proponent	Operation

Performance Indicator	» An employee list should be drawn up indicating the percentage of locals employed. » A Skills Development Plan should be developed. This plan should concentrate on the transfer of skills to employees to increase their capacity and to equip them with alternative skills should they wish to be employed elsewhere. » For each employee a career path should be developed to put mechanisms in place which allows employees to progress from lower skilled working levels to higher skilled and possibly management levels. » Local procurement is undertaken
Monitoring	» Project proponent should be able to demonstrate that the above indicators are implemented.

OBJECTIVE: Assist with social development and enhance capacity building and skills development within the local communities

An important positive role that the project proponent could fulfil as part of their social responsibility towards the local communities is to assist in addressing community development needs. The project applicant is therefore accountable to optimise the productive potential of those employed at the proposed facility's operation through capacity building and skills training, whether these individuals are temporary or permanent employees.

One of the aims of the project could be to revitalise the area in terms of job creation and infrastructure development, in other words it would focus on broad based empowerment.

Project component/s	Capacity building and skills training undertaken during the operational phase.
Potential Impact	» Positive contribution to the capacity of individuals involved with the project, and equipping them with transferable skills » Contribution towards local development initiatives
Activity/risk source	» No social responsibility from project proponent » No contribution towards local development initiatives » Inefficient training or lack of capacity building and skills training
Mitigation: Target/Objective	» Capacity building and skills training should be continuously undertaken during the operational phase of the project

	» Positive social responsibility initiatives

Mitigation: Action/control	Responsibility	Timeframe
Involvement in upliftment programmes could be done according to the needs identified as part of the IDP of the Drakenstein Local Municipality	Project proponent and Drakenstein Local Municipality	Operation
Capacity building and skills training should form part of the social development support provided to local communities.	Project proponent and Drakenstein Local Municipality	Operation
Individual tailor made training programmes for full time employees should be embarked upon in association with accredited training facilities to ensure long term benefits to those involved.	Project proponent	Operation
In cases for the middle to lower skilled jobs, where the relevant skills do not exist, training should be provided to willing local community members to enable them to fill the positions.	Project proponent Drakenstein Local Municipality	Operation
The Skills Development Levy should be established once the project is commissioned to ensure that the benefits of the implementation thereof reach the local communities from the start of the project.	Project proponent Drakenstein Local Municipality	Operation
The project applicant should create conditions that are conducive for the involvement of entrepreneurs, small businesses and SMME's during the operational phase for rendering ancillary services to the proposed facility.	Project proponent	Operation

Performance Indicator	» A Skills Development Plan should be developed. This plan should concentrate on the transfer of skills to employees to increase their capacity and to equip them with alternative skills should they wish to be employed elsewhere. » For each employee a career path should be developed to put mechanisms in place which allows employees to progress from lower skilled working levels to higher skilled and possibly management levels. » Local development initiatives should be supported
Monitoring	» Project proponent should be able to demonstrate that the above indicators are implemented.

OBJECTIVE: Minimise the potential impact on farming activities and on the surrounding landowners

Once operational, the impact on the daily living and movement patterns of neighbouring residents is expected to be minimal and intermittent (e.g. the increase in traffic to and from site, possible dust creation of vehicle movement on gravel roads on site and possible increase in criminal activities). A limited number of workers would be on site on a daily basis with subsequent minimal social impacts in this regard.

The only land that would be sterilised would be the areas actually used for the turbine structures, access roads, fire breaks and associated buildings and sub-station buildings. Agriculture could thus continue on the sections of land between the turbines. It is not anticipated that any activities undertaken as part of the operation and maintenance of the facility would negatively impact on the surrounding property owners'

daily living patterns. They would thus be able to continue their farming practices without interference from the wind energy. An increase in noise is however seen as a concern.

Project component/s	» Possible negative impacts of activities undertaken on site on the activities of surrounding property owners » Impact on farming activities on site
Potential Impact	» Possible limited intrusion impact on surrounding land owners » Possible phasing out of sheep farming
Activity/risk source	» Increase in traffic to and from site could impact on daily living and movement patterns of surrounding residents.
Mitigation: Target/Objective	» Effective management of the facility » Mitigation of intrusion impacts on property owners » Mitigation of impact on farming activities » Limit noise impacts

Mitigation: Action/control	**Responsibility**	**Timeframe**
Effective management of the facility to avoid any environmental pollution focusing on water, waste and sanitation infrastructure and services, and limiting any increase in noise levels	Project proponent	Operation
Vehicle movement to and from the site should be minimised	Project proponent Employees	Operation
Local roads should be maintained to keep the road surface up to standard	Project proponent	Operation
Reduce any negative impacts on farming activities by keeping fencing within the site to a minimum and designing fencing to maximise efficiency of stock movements	Project proponent	Operation
Limit the development on new access roads on site as far as possible	Project proponent and Contractors	Operation
The engineering design of the turbines should thus ensure the least noise as possible	Project proponent and Contractors	Operation

Performance Indicator	» No environmental pollution occur (waste, water and sanitation related) » Limited noise pollution » No intrusion on private properties and on the activities undertaken on the surrounding properties » Continuation of farming activities » No noise increase
Monitoring	» Project proponent should be able to demonstrate that facility is well managed without environmental pollution and that the above requirements have been met

OBJECTIVE: Minimisation of visual impacts

The primary visual impact, namely that of the wind turbines is not possible to mitigate. The functional design of the structures cannot be changed in order to reduce visual impacts. However, the sympathetic

placement of the turbines with respect to the topography may ameliorate the magnitude of the impact somewhat.

The functional design of the structures and the dimensions of the facility cannot be changed in order to reduce visual impacts. Alternative colour schemes (i.e. painting the turbines sky-blue, grey or darker shades of white) are not permissible as the CAA's Marking of Obstacles expressly states, "Wind turbines shall be painted bright white to provide the maximum daytime conspicuousness". Failure to adhere to the prescribed colour specifications will result in the fitting of supplementary daytime lighting to the wind turbines, once again aggravating the visual impact. The potential for mitigation is therefore low or non-existent. Due to the nature of the area within which the facility is planned, there are only a few potentially sensitive receptors.

Other impacts include impacts associated with lighting ~~of substations~~, and the aircraft warning lights mounted on top of the hub of the wind turbines. The regulations for the CAA's *Marking of Obstacles* should be strictly adhered to as the failure of complying with these guidelines may result in the developer being required to fit additional light fixtures at closer intervals thereby aggravating the visual impact.

Project component/s	» Wind turbines » ~~Substation~~ » ~~Power line and service roads for power line servitudes~~
Potential Impact	» Visual impact of facility degradation and vegetation rehabilitation failure.
Activity/risk source	» The viewing of the above mentioned by observers on or near the site.
Mitigation: Target/Objective	» Well maintained and neat facility » To minimise potential for visual impact » To ensure that the facility complies with Civil Aviation Authority requirements for turbine visibility to aircraft » Minimise contrast with surrounding environment and visibility of the turbines to humans » ~~The containment of light emitted from the substations in order to eliminate the risk of additional night-time visual impacts.~~

Mitigation: Action/control	Responsibility	Timeframe
Maintain the general appearance of the facility in an aesthetically pleasing way.	Developer	Operation, Maintenance
Monitor rehabilitated areas, and implement remedial action as and when required.	Developer	Operation, Maintenance
Aviation warning lights must be mounted on turbine hub or such measures required by the Civil Aviation Authority. Indications are that the facility may not be required to fit a light to each turbine, but rather place synchronous flashing lights on the turbines representing the outer perimeter of the facility.	Developer	Erection, maintenance
The turbines will be painted a pale, matt, non-reflective colour (i.e. off white, as specified) and it will be ensured that the specified paint colour is complied with before erection of the turbines.	Contractor	Erection of turbines
~~Ensure that proper planning is undertaken regarding the placement of lighting structures for the substations and that light fixtures only illuminate areas inside the substation site.~~	~~Developer~~	~~Construction, operation, maintenance~~
A lighting engineer must be consulted to assist in the planning and	Developer	Erection,

Mitigation: Action/control	Responsibility	Timeframe
placement of light fixtures in order to reduce visual impacts associated with glare and light trespass.		maintenance
Maintain the general appearance of the facility in an aesthetically pleasing way.	Developer	Operation, maintenance
Undertake regular maintenance of light fixtures.	Developer	Operation, maintenance
Limit access to the Wind Energy Facility site ~~power line and substation to~~ along existing access roads.	Developer	Operation, maintenance
Avoid the unnecessary removal of vegetation within the power line servitudes and limit access to the servitudes (during both construction and operational phases) along existing access roads.	Developer	Operation, maintenance
Mitigation of lighting impacts includes the pro-active design, planning, and specification lighting for the facility by a lighting engineer. The correct specification and placement of lighting and light fixtures for both the turbines and the ancillary infrastructure will go far to contain rather than spread the light. Additional measures include the following: * Shielding the sources of light by physical barriers (walls, vegetation, or the structure itself); * Limiting mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights; * Making use of minimum lumen or wattage in fixtures; * Making use of down-lighters, or shielded fixtures; * Making use of Low Pressure Sodium lighting or other types of low impact lighting. * Making use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.	Developer/ lighting engineer	Operation, maintenance

Performance Indicator	» Well maintained and neat facility with intact vegetation on and in the vicinity of the facility. » Minimised visual intrusion on surrounding areas » Appropriate visibility of infrastructure to aircraft ~~» The effective containment of the light to the substation site.~~
Monitoring	» Monitoring of rehabilitated areas. » Ensure that aviation warning lights or other measures are installed before construction is completed » Ensure that Aviation warning lights or other measures are functional at all times » The monitoring of the condition and functioning of the light fixtures during the operational phase of the project.

9 MANAGEMENT PROGRAMME FOR WIND ENERGY FACILITY: DECOMMISSIONING

The turbine infrastructure which will be utilised for the Zen Wind Farm is expected to have a lifespan of 25 to 30 years (with maintenance). Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life. It is most likely that decommissioning activities of the infrastructure of the facility would comprise the disassembly and replacement of the turbines with more appropriate technology/infrastructure available at that time.

8.1. Site Preparation

Site preparation activities will include confirming the integrity of the access to the site to accommodate required abnormal load equipment and lifting cranes, preparation of the site (e.g. lay down areas, construction platform) and the mobilisation of construction equipment.

8.2 Disassemble and Replace Existing Components

The wind (turbine and tower sections) of the proposed facility will be disassembled once it reaches the end of its economic lifespan. A large crane would be required for disassembling the turbine and tower sections. Once disassembled, the components will be reused, recycled, or disposed of in accordance with regulatory requirements. If deemed necessary, the disassembled components would be replaced with more appropriate technology/infrastructure available at that time.

OBJECTIVE: To avoid and or minimise the potential impacts associated with the decommissioning phase.

Project component/s	»	Decommissioning phase of the Wind Energy Facility.
Potential Impact	»	Decommissioning will result in job losses, which in turn can result in a number of social impacts, such as reduced quality of life, stress, depression etc. However, the number of people affected (~20) is relatively small. Decommissioning is also similar to the construction phase in that it will also create temporary employment opportunities.
Activity/risk source	»	Decommissioning of the Wind Energy Facility.
Mitigation: Target/Objective	»	To avoid and or minimise the potential social impacts associated with decommissioning phase of the Renewable Energy Facility.

Mitigation: Action/control	Responsibility	Timeframe
The developer should ensure that retrenchment packages are provided for all staff who stand to lose their jobs when the facility is decommissioned Retrenchments should comply with South African Labour legislation of the day.	Developer	Decommissioning
The developer should investigate the option of relocating employees to other renewable energy facilities when the Zen Wind Farm is decommissioned (if feasible).	Developer	Decommissioning
The developer should establish an Environmental Rehabilitation Trust Fund to cover the costs of decommissioning and rehabilitation of disturbed areas. The Trust Fund should be funded	Developer	Decommissioning

Mitigation: Action/control	Responsibility	Timeframe
by a percentage of the revenue generated from the sale of energy to the national grid over the 25 - 30 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.		
Rehabilitation should start immediately after decommissioning is completed.	Developer	Straight after Decommissioning
All excavations must be rehabilitated with soil and topsoil, which should not contain invasive plant species (in compliance with the CARA, as amended), to the satisfaction of the ECO.	Developer ECO	Decommissioning
Re-vegetation specifications to be developed.	Developer	Decommissioning
All building materials must be removed from the site. All compacted surfaces must be ripped and re-vegetated as per the re-vegetation specifications.	Developer	Decommissioning
The most suitable seed mix for disturbed areas to be used in rehabilitation would include indigenous species.	Developer	Decommissioning
Rehabilitation to be conducted in a progressive manner (i.e. once decommissioning in an area has been completed the area will be rehabilitated). The rehabilitation of the area with indigenous vegetation must coincide with the rainfall events and all alien invasive vegetation shall be removed.	Developer	Decommissioning
Rehabilitation measures for the site are to include the following: » Re-contouring Subsoil stockpiles should be used to re-contour construction affected areas. The Contractor shall restore the profile, soil condition and landform to as close as possible state to the pre-construction state. » Scarification and ripping All areas where rehabilitation interventions are required shall be cross-ripped before topsoil placement. Topsoil and fertile soil shall be uniformly scarified to allow for vegetation growth » Fertilising The Contractor shall be required to perform soil analysis tests on the top 75mm of prepared surface prior to re-vegetation/seeding to determine the required fertiliser levels for permanent cover. » Seed acquisition The Contractor shall purchase seed from a South African National Seed Organisation (SANSOR) accredited dealer. Seed used for rehabilitation shall not be older than one season. Purchased seed must be of the correct species and of known origin, dried and packed, conforming to all legal requirements for seed.	Developer Contractor	Decommissioning
The Contractor shall schedule works for placing of topsoil once all infrastructure has been successfully decommissioned. Seeding can then take place after the first rains of the season and should	Contractor	Decommissioning

Mitigation: Action/control	Responsibility	Timeframe
be concluded by one month before the end of the growing season.		
The seed mix for use in rehabilitation must be an approved mix of indigenous grass species common to the area.	Contractor	Decommissioning
The Contractor shall maintain rehabilitated areas free of weeds and invader plants until the end of the Defects Notification Period applicable to rehabilitation. Control of weeds and invader plants must be done in accordance with the specifications stipulated in the CARA.	Contractor	Decommissioning
The Contractor shall be responsible for the prevention of erosion in areas impacted upon by their activities. All erosion repairs must be implemented at the first signs thereof and no erosion shall be allowed to develop on a large scale.	Contractor	Decommissioning
If required, at the time of decommissioning, the developer must submit a method statement to the DWA / DEA to manage and rehabilitate the work in any wetlands. Wetlands shall be rehabilitated immediately after decommissioning has been completed as these are sensitive habitats and disturbance must be kept to a minimum. The beds of the wetlands shall be restored to a similar state, in terms of the soil profile, as well as physical and chemical properties as established in the pre-construction survey.	Contractor	Decommissioning
All recyclable rubble and solid waste (e.g. scrap metal, cables, bottles, cans, and plastic residues) shall be collected and disposed of through a registered recycling company. Waste manifests will be kept by the Contractor and shown to the ECO on request. All non-recyclable rubble and solid waste shall be collected and disposed of at an approved waste disposal site. Waste manifests will be shown to the ECO on request.	Contractor	Decommissioning

Performance Indicator	South African Labour legislation at the relevant time
Monitoring	» Retrenchments should comply with South African Labour legislation of the day » ECO to monitor rehabilitation

Appendix A:
Layout Plan

Zen Wind Farm
Western Cape Province

Locality Map

N

NAYOTH 458

9/88

BONNE ESPERANCE
2/83

BONNE ESPERANCE
1/83

Klein Berg

R44

LABONNE SUBSTATION

LABONNE / WINDMILL 1 132kV OHL

Gouda

Decommissioned - GOUDA / MOORREESBURG 1 66kV OHL

GOUDA / ONGEGUND 1 66kV OHL

Berg

GOUDA SUBST

ekus 1 765kV

0 0,75 1,5 3 Km

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

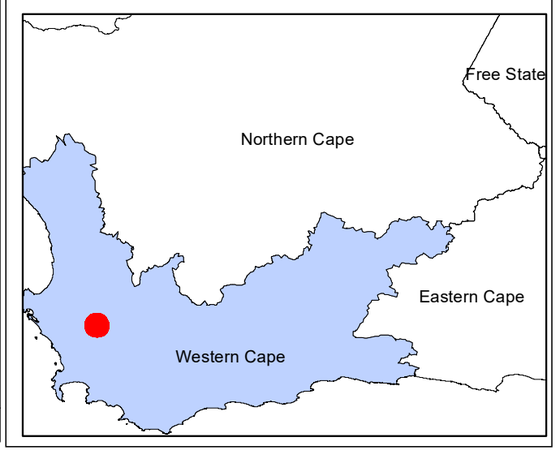
- Towns
- Eskom Substation
- Existing Power Line
- Main Roads
- Perennial River
- Non-Perennial River

Zen Wind Farm

- Zen Development Area
- Affected Properties

savannah environmental

Scale: 1: 40 000
Projection: WGS_GCS_1984
Map Ref: Zen Wind Farm Locality July'23



Zen Wind Farm
Western Cape Province

Amended Facility Layout Map

N

BONNE ESPERANCE
1/83

BONNE ESPERANCE
2/83

NAYOTH 458

9/88

Z1
Z2
Z3
Z4
Z5
Z6
Z7
Z8
Z9
Z10
Z11
Z12
Z13
Z14
Z15
Z16
Z17

Klein-Berg

R44

LABONNE SUBSTATION

LABONNE / WINDMILL 1 132kV OHL

GOUDA / ONGEGUND 1 66kV OHL

Gouda

Berg

1231 m
1480 m
535 m

0 0,75 1,5 3
Km

Sources: Esri, HERE, Garmin, Intermap, in… …GN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Legend

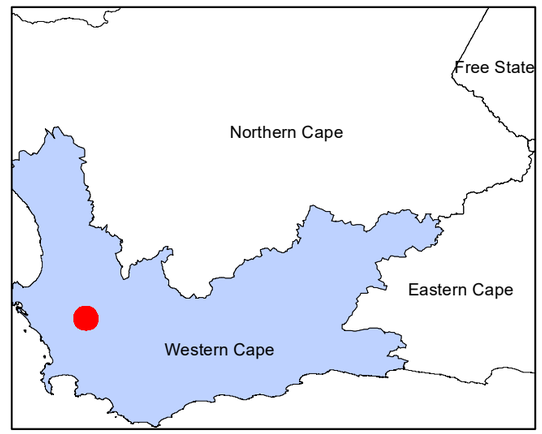
- Towns
- Eskom Substation
- Existing Power Line
- Main Roads
- Perennial River
- Non-Perennial River

Zen Wind Farm Layout

- New Access Roads
- Existing Access Roads
- Wind Turbines
- Wind Turbine Platform
- Zen Development Area
- Affected Properties

savannah environmental

Scale: 1: 40 000
Projection: WGS_GCS_1984
Map Ref: Zen Wind Farm Amended Layout Rev1 July'23



Zen Wind Farm
Western Cape Province

Amended Facility
Layout and Sensitivity Map

Legend

- Towns
- Eskom Substation
- Existing Power Line
- Main Roads
- Perennial River
- Non-Perennial River

Zen Wind Farm Layout

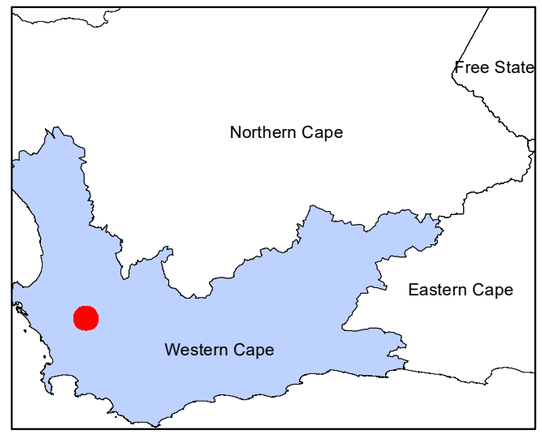
- New Access Roads
- Existing Access Roads
- Wind Turbines
- Wind Turbine Platform
- Zen Development Area

Environmnetal Sensitivities

- Semi-Natural Landscape Features (Very High to High Ecological Sensitivity)
- Natural Landscape Features (Very High Ecological Sensitivity)
- Drainge Features (Very High Ecological Sensitivity)
- Canal (High Ecological Sensitivity)
- Bat Roosts (High Bat Sensitivity)
- Bat Roost (500m Buffer) (High Bat Sensitivity)
- Medium-Large Rivers (Very High Bird & Bat Sensitivity)
- Water Body (High Birds & Bat Sensitivity)
- Agricultural Land Potential (Very High Soil Sensitivity)
- Agricultural Land Potential (High Soil Sensitivity)
- Noise Sensitive Receptors (Low Sensitivity)

savannah environmental

Scale: 1: 45 000
Projection: WGS_GCS_1984
Map Ref: Zen Wind Farm Amended Layout & Sens Rev2 July'23



N

Z1 Z2 Z3 Z4 Z5 Z6 Z7 Z8 Z9 Z10 Z11 Z12 Z13 Z14 Z15 Z16 Z17

Main Berg

R44

LABONNE SUBSTATION

LABONNE / WINDMILL 2 132kV OHL

Decommissioned - GOUDA / MOORREESBURG 1 66kV OHL

GOUDA / ONGEGUND 1 66kV OHL

Berg

Gouda

NUWEKLOOF SUBSTATION

GOUDA SUBSTATION

GOUDA TRACTION

Kappa/Sterrekus 1 765kV

0 1 2 4 Km

Sources: Esri, HERE, Garmin, Intermap, inc ... er NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Appendix B:

Alien Invasive Management Plan

ZEN WIND FARM ALIEN INVASIVE PLANT MANAGEMENT PLAN

1. OVERALL MANAGEMENT PLAN OBJECTIVE

The purpose of the Alien Plant Management Plan is to provide a framework for the management of alien and invasive plant species during the construction and operation of the Zen Wind Farm. The broad objectives of the plan include the following:

- Ensure alien plants do not become dominant in parts or the whole landscape through the control and management of alien and invasive species 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

2. SITE & LEGISLATIVE CONTEXT

The site consists of highly contrasting ecological sensitivity, with transformed areas being of low sensitivity and the intact remnants of Swartland Alluvium Fynbos and Swartland Shale Renosterveld being of very high sensitivity. The vast majority of the development area is however transformed and retains very little biodiversity. The amended facility layout comprising 17 turbines are all located within agricultural lands. No turbines are planned east of the R44 road. As such, the development would not result in an increase in the terrestrial footprint associated with the development, and does not encroach on any natural areas. In addition, the project site is almost entirely transformed and the layout does not impact any potentially sensitive areas.

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.

Fynbos ecosystems are particularly vulnerable to alien invasion. In addition, when fynbos ecosystems become invaded by nitrogen-fixing legumes such as *Acacia saligna*, the increased soil nutrient levels that develop as a result, retard the re-establishment of the fynbos and promote the persistence of weeds and invader plants. Fire also plays in interactive role with many invaders which spread rapidly following fires which stimulate the release or germination of alien plant seeds. Due to the relationship between fire and the spread of alien species, the management of aliens in fynbos ecosystems is intricately linked to fire management.

Conservation of Agricultural Resources Act (Act No. 43 of 1983)

In terms of the amendments to the regulations under the Conservation of Agricultural Resources Act (Act No. 43 of 1983), all declared alien plant species must be effectively controlled. Landowners are legally responsible for the control of invasive alien plants on their properties. In terms of this Act, alien invasive plant species are ascribed to one of the following categories:

» 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.

National Environmental Management: Biodiversity Act, 2004 (Act No.10 of 2004)

The National Environmental Management: Biodiversity Act (NEM:BA) regulates all invasive organisms in South Africa, including a wide range of fauna and flora. Regulations have been published in Government Notices R.506, R.507, R.508 and R.509 of 2013 under NEM:BA. According to this Act and the regulations, any species designated under Section 70 cannot be propagated, grown, bought or sold without a permit. Below is an explanation of the three categories:

» **Category 1a:** Invasive species requiring compulsory control. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
» **Category 1b:** Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.
» **Category 2:** Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones.
» **Category 3:** Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones.

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

It is important to note that alien plant species that are regulated in terms of the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA) as weeds and invader plants are exempted from NEM:BA. This implies that the provisions of the CARA in respect of listed weed and invader plants supersede those of NEM: BA.

3. ALIEN SPECIES PRESENCE & ABUNDANCE AT ZEN WIND FARM

The Zen Wind Farm Site is very heavily invaded by alien species, which can be attributed to a number of different factors including the long history of intensive land use in the area, as well as presence of susceptible environments such as riverine areas and drainage courses. The major drainage feature which occurs within the site is Klein Berg River which bisects the larger site.

The banks of rivers are dominated by alien woody species, mainly *Eucalyptus camaldulensis*, *Acacia saligna* and *Sesbania punicea*. Along the banks and side channels, species such as *Bolboschoenus maritimus*, *Cotula turbinata*, *Cotula coronopifolia*, *Persicaria attenuata* subsp. *attenuata* and *Rumex crispus* were observed along the Klein Berg River. Outside of the main channel itself, the floodplain consists of sandy flats

and hummocks dominated by *Cynodon dactylon and various shrubs and forbs such as Wiborgia fusca subsp. fusca, Eriocephalus africanus var. africanus, Galenia africana, Leysera gnaphalodes, Lobelia erinus and Monopsis simplex. Alien species were also common or dominant in this area and included Bromus diandrus, Echium plantageum, Lolium rigidum, Polypogon monspeliensis, Erodium cicutarium, Hordeum murinum and Hypochaeris radicata*. These species compete with the indigenous species and result in a decline in species diversity, which is especially an issue where there are species and vegetation types of conservation concern present, as is the case for the Zen Wind Farm site. **Figure 1** below shows the example drainage lines at the Zen site. In the left image, the Klein Berg River, dominated by the alien species *Eucalyptus camalduensis, Acacia saligna* and *Sesbania punicea*. In the right image, a smaller drainage line which has been canalised as can be seen from the large embankment on the other side of the stream and which retains little of the original character, but nevertheless retains value as habitat for amphibians and other fauna.

Figure 1: Drainage lines at the Zen site and alien plant species around the site

There are some very small relicts as well as a significant remnant of Swartland Alluvium Fynbos towards the north-east of the site, just to the west of the canal. Although disturbed, there are some areas which do not appear to have been ploughed, at all or at least not for several decades. This is one of the few remaining areas of semi-natural vegetation within the area targeted for development. The vegetation consists of a mix of low and medium tall shrubs with tussock grasses. Species observed in this area includes shrubs such as *Aspalathus pinguis* subsp. *pinguis*, *Aspalathus tridentata* subsp. *tridentata*, *Aspalathus perfoliata* subsp. *phillipsii*, *Aspalathus uniflora*, Hermannia multiflora Searsia dissecta Searsia incisa var. incise. Grasses observed in the area include *Merxmuellera stricta*, *Eragrostis curvula*, *Ehrharta ramosa* and *Stipagrostis zeyheri* subsp. *zeyheri*. A number of geophytes were also observed in the area including *Watsonia marginata*, *Lapeirousia anceps* and *Ferraria uncinata*, which suggests that additional geophyte species are also likely to be present in this area, but were likely already over at the time of the site visit. Species of conservation concern observed in this area include *Aspalathus aculeata* which is classified as Vulnerable and *Phylica plumosa* which is classified as Declining. The presence of these species in the area suggests that there may other species of conservation concern present as well, especially geophytes which were over at the time of the site visit.

4. ACTIVITIES LIKELY TO IMPACT SPECIES ABUNDANCE

Alien species are adept at taking advantage of disturbance. Given the abundance of alien species across most of the site, there is already a well-developed seed bank of alien species present. The disturbance created by the construction phase of the development will certainly stimulate the growth

and invasion of alien species into these areas. Where natural or alien vegetation is cleared, weedy species will be quick to colonise the disturbed areas, followed by the larger woody species such as *Acacia saligna*. Although it is probably not practical to control all the forbs and alien grasses, an increase in woody species is undesirable and should be prevented within the development footprint. Particular problem areas resulting from the construction of the facility are likely to be disturbed roadsides and areas which receive runoff from the roads; turbine service areas; cable trenches, especially in wet areas; and any other disturbed areas created during construction.

5. ALIEN PLANT MANAGEMENT PRINCIPLES

5.1. Prevention and early eradication

A prevention strategy should be considered and established, including regular surveys and monitoring for invasive alien plants, effective rehabilitation of disturbed areas and prevention of unnecessary disturbance of natural areas.

Monitoring plans should be developed which are designed to identify Invasive Alien Plant Species already on site, as well as those that are introduced to the site by the construction activities. Keeping up to date on which weeds are an immediate threat to the site is important, but efforts should be planned to update this information on a regular basis. When additional Invasive Alien Plant Species are recorded on site, an immediate response of locating the site for future monitoring and either hand-pulling the weeds or an application of a suitable herbicide (where permissible only) should be planned. It is, however, better to monitor regularly and act swiftly than to allow invasive alien plants to become established on site.

5.2. Containment and control

If any alien invasive plants are found to become established on site, action plans for their control should be developed, depending on the size of the infestations, budgets, manpower considerations and time. Separate plans of control actions should be developed for each location and/or each species. Appropriate registered chemicals and other possible control agents should be considered in the action plans for each site/species. The use of chemicals are not recommended for any wetland areas. Herbicides should be applied directly to the plant and not to the soil. The key is to ensure that no invasions get out of control. Effective containment and control will ensure that the least energy and resources are required to maintain this status over the long-term. This will also be an indicator that natural systems are impacted to the smallest degree possible.

5.3. General Clearing and Guiding Principles

Alien species control programmes are long-term management projects and should consist of a clearing plan which includes follow up actions for rehabilitation of the cleared area. The 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 alien species are easily dispersed across boundaries by wind or watercourses. All clearing actions should be monitored and documented to keep records of which areas are due for follow-up clearing.

i. Clearing Methods

Different species require different clearing methods such as manual, chemical or biological methods or a combination of both. Care should however be taken so that the clearing methods used do not encourage further invasion and that they are appropriate to the specific species of concern. As such, regardless of the methods used, disturbance to the soil should be kept to a minimum.

Fire should not be used for alien species control or vegetation management at the site. The best-practice clearing method for each species identified should be used.

» **Mechanical control**

This entails damaging or removing the plant by physical action. Different techniques could be used, e.g. uprooting, felling, slashing, mowing, ringbarking or bark stripping. This control option is only really feasible in sparse infestations or on a small scale, and for controlling species that do not coppice after cutting. Species that tend to coppice, need to have the cut stumps or coppice growth treated with herbicides following the mechanical treatment. Mechanical control is labour intensive and therefore expensive and could cause severe soil disturbance and erosion.

» **Chemical Control**

Although it is usually preferable to use manual clearing methods where possible, such methods may create additional disturbance which stimulates alien plant 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 at 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.
- The use of chemicals is not recommended for wetland areas.

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

- Working for Water: Policy on the Use of Herbicides for the Control of Alien Vegetation.
- Pesticide Management Policy for South Africa published in terms of the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No. 36 of 1947) – GNR 1120 of 2010.
- South African Bureau of Standards, Standard SANS 10206 (2010).

According to Government Notice No. 13424 dated 26 July 1992, it is an offence to "*acquire, dispose, sell or use an agricultural or stock remedy for a purpose or in a manner other than that specified on the label on a container thereof or on such a container*".

Contractors using herbicides need to have a valid Pest Control Operators License (limited weeds controller) according to the Fertilizer, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act No. 36 of 1947). This is regulated by the Department of Environment, Forestry and Fisheries.

» **Biological control**

Biological weed control consists of the use of natural enemies to reduce the vigour or reproductive potential of an invasive alien plant. Biological control agents include insects, mites, and micro-organisms such as fungi or bacteria. They usually attack specific parts of the plant, either the reproductive organs directly (flower buds, flowers or fruit) or the seeds after they have dropped. The stress caused by the biological control agent may kill a plant outright or it might impact on the plant's reproductive capacity. In certain instances, the reproductive capacity is reduced to zero and the population is effectively sterilised. All of these outcomes will help to reduce the spread of the species.

To obtain biocontrol agents, provincial representatives of the Working for Water Programme or the Directorate: Land Use and Soil Management (LUSM), DWS can be contacted.

5.4. General management practices

The following general management practices should be encouraged or strived for:

- Establish an on-going monitoring programme for the construction phase to detect and quantify any alien species that may become established.
- Alien vegetation regrowth on areas disturbed by construction must be immediately controlled.
- Care must be taken to avoid the introduction of alien invasive plant species to the site. 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.
- Cleared areas that have become invaded by alien species can be sprayed with appropriate herbicides provided that these herbicides break down on contact with the soil. Residual herbicides should not be used.
- The effectiveness of vegetation control varies seasonally, and this is also likely to impact alien species. Control early in the wet season will allow species to regrow, and follow-up control is likely to be required. It is tempting to leave control until late in the wet season to avoid follow-up control. However, this may allow alien species to set seed before control, and hence will not contribute towards reducing alien species abundance. Therefore, vegetation control should be aimed at the middle of the wet season, with a follow-up event towards the end of the wet season. There are no exact dates that can be specified here as each season is unique and management must therefore respond according to the state and progression of the vegetation.
- Alien plant management is an iterative process and it may require repeated control efforts to significantly reduce the abundance of a species. This is often due to the presence of large and persistent seed banks. However, repeated control usually results in rapid decline once seed banks become depleted.

- Some alien species are best individually pulled by hand. Regular vegetation control to reduce plant biomass within the site should be conducted. This should be timed so as to coincide with the critical growth phases of the most important alien species on site. This will significantly reduce the cost of alien plant management as this should contribute towards the control of the dominant alien species and additional targeted control will be required only for a limited number of species.
- 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.
- During operation, surveys for alien species should be conducted regularly. It is recommended that this be undertaken every 6 months for the first two years after construction and annually thereafter. All alien plants identified should be cleared using appropriate means.

5.5. Monitoring

In order to assess the impact of clearing activities, follow-ups and rehabilitation efforts, monitoring must be undertaken. This section provides a description of a possible monitoring programme that will provide an assessment of the magnitude of alien plant invasion on site, as well as an assessment of the efficacy of the management programme.

In general, the following principles apply for monitoring:

- Photographic records must be kept of areas to be cleared prior to work starting and at regular intervals during initial clearing activities. Similarly, photographic records should be kept of the area from immediately before and after follow-up clearing activities. Rehabilitation processes must also be recorded.
- Simple records must be kept of daily operations, e.g. area/location cleared, labour units and, if ever used, the amount of herbicide used.
- It is important that, if monitoring results in detection of invasive alien plants, that this leads to immediate action.

The following monitoring should be implemented to ensure management of alien invasive plant species.

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.

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. Fynbos soils are usually very low in organic matter and the use of manure or other soil amendments is likely to encourage invasion.	Weekly
Clearing of vegetation is not allowed within 32m of any wetland, 80m 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
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 DWS 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

Monitoring – Construction Phase

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

Monitoring Action	Indicator	Timeframe
Document alien plant species distribution and abundance over time at the site	Alien plant distribution map	3 Monthly
Document alien species present at the site	List of species	Preconstruction
Document alien plant control measures implemented and success rate achieved	Records of control measures and their success rate. A decline in alien distribution and cover over time at the site.	3 Monthly
Document rehabilitation measures implemented and success achieved in problem areas	Decline in vulnerable bare areas over time	Biannually

Operation 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.

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 within priority areas 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 (early winter).
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 esthetic purposes, then non-invasive, water-wise locally-occurring species should be used.	When necessary

Monitoring - Operation Phase

The following monitoring and evaluation actions should take place during the operational phase of the development.

Monitoring Action	Indicator	Timeframe
Document alien plant control measures implemented and success rate achieved	Records of control measures and their success rate A decline in alien distribution and cover over time at the site	Biannually
Document alien species distribution and abundance over time at the site	Alien plant distribution map	Biannually

Appendix C:

Re-Vegetation & Rehabilitation Plan

REVEGETATION AND HABITAT REHABILITATION PLAN

The site consists of highly contrasting ecological sensitivity, with transformed areas being of low sensitivity and the intact remnants of Swartland Alluvium Fynbos and Swartland Shale Renosterveld being of very high sensitivity. The vast majority of the development area is however transformed and retains very little biodiversity. The amended facility layout comprising 17 turbines are all located within agricultural lands. No turbines are planned east of the R44 road. As such, the development would not result in an increase in the terrestrial footprint associated with the development, and does not encroach on any natural areas. In addition, the project site is almost entirely transformed and the layout does not impact any potentially sensitive areas.

1. PURPOSE

The purpose of the Revegetation and Rehabilitation Plan for the Zen Wind Farm is to ensure that areas cleared or impacted during construction of the facility are rehabilitated with a plan cover that reduces the risk or erosion from these areas, as well as restores some biodiversity and ecosystem function. The purpose of the Rehabilitation Plan at the site can be summarised as follows:

» Achieve long-term stabilisation of all disturbed areas to minimise erosion potential.
» Re-vegetate any disturbed areas outside of agricultural lands with suitable plant species;
» Re-vegetate any disturbed areas within natural vegetation with indigenous species to reduce alien plant invasion.
» Ensure that disturbed areas are safe for future uses.

It is also important to recognise that a rehabilitation plan and an erosion control plan should function hand in hand as the two factors are inextricably linked.

2. IDENTIFICATION OF TARGET AREAS

The construction activities required for the development will result in a lot of disturbance at the site and some areas will need to be prioritised over others to ensure that rehabilitation quickly follows construction-related disturbance within the priority areas. Priority areas where the risks of erosion and other negative effects are highest should therefore be identified by the ECO and prioritised for rehabilitation. Such priority areas includes steep slopes, areas of natural vegetation and vulnerable ecosystems such as drainage lines.

The purpose of rehabilitation or revegetation within transformed versus natural parts of the site should not be the same. Rather, three different zones with different biodiversity potential and rehabilitation goals can be identified. These can be described as follows:

Active Lands – These are areas that are actively cultivated on a regular basis. Little or no revegetation is required in these areas given the regular cropping that occurs here. The disturbance created during construction will, however, loosen the soil and remove any plant cover present which will leave the disturbed areas vulnerable to erosion. The disturbed areas should therefore be contoured appropriately to limit runoff and reduce erosion potential.

Old Lands – Old lands which are no longer cultivated or are only cultivated irregularly. These areas are dominated by weedy indigenous and alien species such as *Cynodon, Echium plantageum, Bromus, Avena, Lolium, Erodium* etc. Disturbed ground within these areas is likely to be quickly recolonised by many of the weedy annuals already present. However, more stable rehabilitation can be achieved by sowing a perennial soil-binding species such as *Cynodon dactylon* in these areas. As these areas are heavily grazed, there is little utility in sowing indigenous fynbos species within these areas.

Natural and semi-natural areas – No turbines are within semi-natural areas that have either not be transformed in the past or have been transformed in the distant past and have since recovered a significant amount of shrub cover. These areas retain some biodiversity and ecosystem function and should be rehabilitated with the dominant species present within the affected areas if they are disturbed during construction. Suitable species that could be used include *Athanasia trifurcata, Elytropappus rhinocerotis, Aspalathus spinosa Ehrharta rigida, Metalasia octoflora, Eriocephalus africanus, Nylandtia spinosa* and *Anthospermum spathulatum*. The exact species used would need to be adjusted based on the local conditions and dominant species present.

3. REHABILITATION METHODS AND PRACTISES

The following general management practices should be encouraged or strived for:

Topsoil Management

Effective topsoil management is a critical element of rehabilitation as soil properties are a fundamental determinant of vegetation composition and abundance. Within the context of the site, this is an issue primarily in the natural and semi-natural areas where the re-establishment of some natural vegetation is the desired goal. Within these areas, the topsoil should be set aside during construction and used afterwards to cover cleared and disturbed areas once construction activity has ceased. The efficient use of topsoil is an important element of the rehabilitation strategy because it can obviate the need to active rehabilitation using seed or plants as the topsoil may contain sufficient seed of indigenous species to generate good spontaneous recovery of the vegetation.

- Topsoil is the top-most layer (0-25cm) of the soil in undisturbed areas. This soil layer is important as it contains nutrients, organic matter, seeds, micro-organisms fungi and soil fauna. All these elements are necessary for soil processes such as nutrient cycling and the growth of new plants. The biologically active upper layer of the soil is fundamental in the maintenance of the entire ecosystem.
- Topsoil should be retained on-site in order to be used for site rehabilitation. The correct handling of the topsoil is a key element to rehabilitation success. Firstly it is important that the correct depth of topsoil is excavated. If the excavation is too deep, the topsoil will be mixed with sterile deeper soil, leading to reduction in nutrient levels and a decline in plant performance on the soil.
- Wherever possible, stripped topsoil should be placed directly onto an area being rehabilitated. This avoids stockpiling and double handling of the soil. Topsoil placed directly onto rehabilitation areas contains viable seed, nutrients and microbes that allow it to revegetate more rapidly than topsoil that has been in stockpile for long periods.
- If direct transfer is not possible, the topsoil should be stored separately from other soil heaps until construction in an area is complete. The soil should not be stored for a long time and should be used as soon as possible. The longer the topsoil is stored, the more seeds, micro- organisms and soil biota are killed.

- Ideally stored topsoil should be used within a month and should not be stored for longer than three months. In addition, topsoil stores should not be too deep, a maximum depth of 1m is recommended to avoid compaction and the development of anaerobic conditions within the soil.
- If topsoil is stored on a slope then sediment fencing should be used downslope of the stockpile in order to intercept any sediment and runoff should be directed away from the stockpiles upslope.

Mulching

Mulching is the covering of the soil with a layer of organic matter of leaves, twigs bark or wood chips, usually chopped quite finely. The main purpose of mulching is to protect and cover the soil surface as well as serve as a source of seed for revegetation purposes.

- During site clearing the standing vegetation should not be cleared and mixed with the soil, but should be cleared separately, either mechanically or by hand using a brush-cutter. The cleared vegetation should be stockpiled and used whole or shredded by hand or machine to protect the soil in disturbed areas and promote the return of indigenous species.
- Mulch is to be harvested from areas that are to be denuded of vegetation during construction activities, provided that they are free of seed-bearing alien invasive plants;
- No harvesting of vegetation may be done outside the area to be disturbed by construction activities;
- Brush-cut mulch shall be stored for as short a period as possible, and seed released from stockpiles shall be collected for use in the rehabilitation process.

Seeding

In some areas the natural regeneration of the vegetation may be poor and the application of seed to enhance vegetation recovery may be required. Seed should be collected from plants present at the site and should be used immediately or stored appropriately and used at the start of the following wet season. Seed can be broadcast onto the soil, but should preferably be applied in conjunction with measures to improve seedling survival such as scarification of the soil surface or simultaneous application of mulch.

- Indigenous seeds may be harvested for purposes of re-vegetation in areas that are free of alien / invasive vegetation, either at the site prior to clearance or from suitable neighbouring sites;
- Seed may be harvested by hand and if necessary dried or treated appropriately;
- Seed gathered by vacuum harvester, or other approved mass collection method, from suitable shrubs or from the plant litter surrounding the shrubs must be kept apart from individually harvested seed;
- No seed of alien or foreign species should be used or brought onto the site. Seed used at the site should be restricted to that collected on-site, even for indigenous species.
- A list of potentially suitable species includes: *Athanasia trifurcata, Elytropappus rhinocerotis, Aspalathus spinosa Ehrharta rigida, Metalasia octoflora, Eriocephalus africanus*, *Nylandtia spinosa* and *Anthospermum spathulatum*, but which species are ultimately used need not be restricted to these species and any locally occurring species with seed available could be used.

Transplants

Where succulent plants are available or other species which may survive translocation are present, individual plants can be dug out from areas about to be cleared and planted into areas which require revegetation. This can be an effective means of establishing indigenous species quickly.

» Plants for transplant should only be removed from areas that are going to be cleared.
» Perennial grasses, shrubs, succulents and geophytes are all potentially suitable candidates for transplant.
» Transplants should be nearby and should not be transported around the site to distant areas.
» Transplants must remain within the site and may not be transported off the site.
» Even if some transplants die, the dead plants protect the soil surface, collect organic matter and provide nurse sites for the establishment of indigenous plants.

Use Of Soil Savers

On steep slopes and areas where seed and organic matter retention is low, or where the risk of wind erosion is high as a result of sandy soils, it is recommended that soil savers are used to stabilise the soil surface. Soil savers are man-made materials, usually constructed of organic material such as hemp or jute and are usually applied in areas where traditional rehabilitation techniques are not likely to succeed.

» In areas where soil saver is used, it should be pegged down to ensure that is captures soil and organic matter flowing over the surface.
» Soil saver may be seeded directly once applied as the holes in the material catch seeds and provide suitable microsites for germination.
» Soil saver can be applied in conjunction with mulch, being applied over the top of the mulch and serving the purpose of holding the mulch down so that it does not blow or get washed away.

4. 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 rehabilitated areas. During the construction phase, the Environmental Office (EO) and Engineering, Procurement and Construction (EPC) Contractor will be responsible for initiating and maintaining a suitable monitoring system. Once the development is operational, the Developer / O&M Operator will need 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:

» Associated nature and stability of surface soils.
» Re-emergence of alien and invasive plant species. If noted, remedial action must be taken immediately, as per the alien management plan and mitigation measures contained within the EMPr.

Rehabilitation success, monitoring and follow-up actions are important to achieve the desired cover and soil protection. The following monitoring protocol is recommended:

» Rehabilitated areas should be monitored (responsibility of the EO) on a weekly basis throughout the construction phase and on a monthly basis thereafter and to the point where the area has been rehabilitated to a satisfactory level.
» Ensure that steep slopes are not de-vegetated unnecessarily and subsequently become hydrophobic (i.e., have increased runoff and a decreased infiltration rate) increasing the erosion potential.

- Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilisation. Therefore, the timeframe between construction activities and rehabilitation should be minimised. Phased construction and progressive rehabilitation, where practically possible, are therefore important elements of the erosion control and rehabilitation strategy.
- Any areas showing erosion, should be adaptively managed with particular erosion control measures, depending on the extent of the erosion.

If the current state of the environment prior to construction (which will be disturbed during the construction phase) is not achieved post impact, within the specified rehabilitation period, maintenance of these areas must continue until an acceptable state is achieved (excluding alien plant species or weeds). Additional rehabilitation methods may be necessary to achieve the current state before construction commenced.

Monitoring of the rehabilitation success, as well as follow-up adaptive management, combined with the clearing of emerging alien plant species should all continue for as long as is considered necessary, depending on regrowth rates.

Appendix D:

Stormwater Management Plan

STORMWATER MANAGEMENT GUIDE

1. PURPOSE

By taking greater cognisance of natural hydrological patterns and processes, it is possible to develop storm water management systems in a manner that reduces these potentially negative impacts and mimic nature. The main risks associated with inappropriate storm water management are increased erosion risk and risks associated with flooding. Therefore, this Stormwater Management Guide and the Erosion Management Plan are closely linked to one another and should be managed together.

This Stormwater Management Guide addresses the management of stormwater runoff from the development area and significant impacts relating to resultant impacts such as soil erosion and downstream sedimentation. The main factors influencing the planning of stormwater management measures and infrastructure are:

» Topography and slope gradients.
» Placing of infrastructure and infrastructure design.
» Annual average rainfall.
» Rainfall intensities.

The objective of these guiding principles is therefore to provide measures to address runoff from disturbed portions of the development area, such that they:

» Do not result in concentrated flows into natural watercourses i.e., provision should be made for temporary or permanent measures that allow for attenuation, control of velocities and capturing of sediment upstream of natural watercourses.
» Do not result in any necessity for concrete or other lining of natural watercourses to protect them from concentrated flows off the development if not necessary.
» Do not divert flows out of their natural flow pathways, thus depriving downstream watercourses of water.

This Stormwater Management Guide must be updated and refined once the construction/ civil engineering plans have been finalised following detailed design.

2. RELEVANT ASPECTS OF THE SITE

The development site is located within the G10F Subquaternary (Quinary) catchment associated with the Berg River mainstem located within the South Western Coastal Belt Ecoregion (Figure 1).

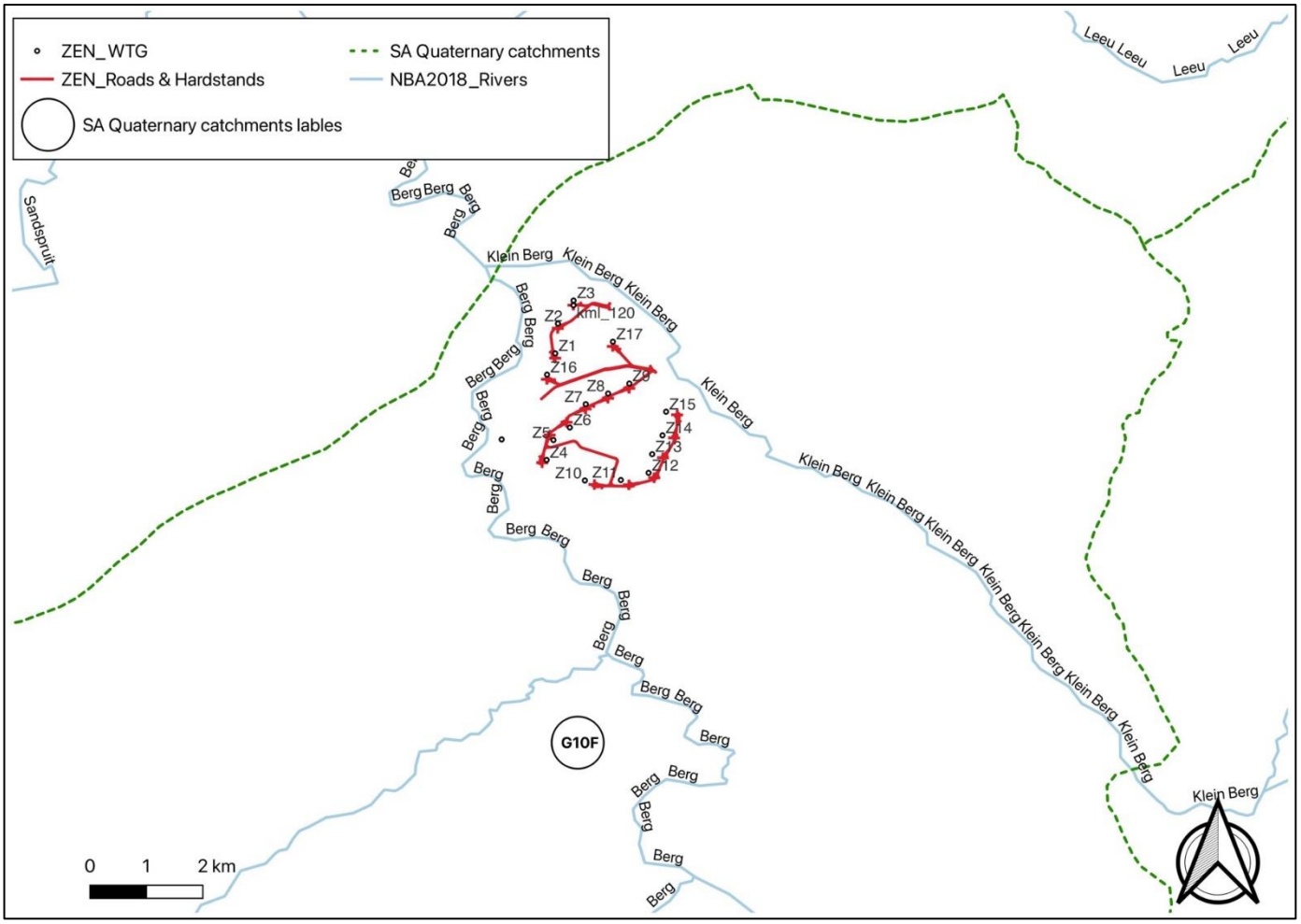


Figure1: Project locality map indicating the various quaternary catchment boundaries (green line) in relation to the development area (Source DWS and NGI)

The development area contains short tributaries that link to the Berg & Klein Berg Rivers, consisting mostly of perennial watercourses, non-perennial rivers some with valley bottom wetlands (Klein Berg) that are highly constrained by the conversion of the previously natural Swartland Shale Renosterveld to agricultural fields, i.e. the only remaining natural vegetation within the study area are these remaining wetland areas. All of the minor drainage lines indicated in the Biodiversity Spatial Plan as Ecological Support Areas, are shown high a degree of constraint and or canalisation.

Overall, these systems would be considered Largely Modified, however it is still important to protect these areas due to the vegetation and fauna still observed within these habitats. The ecosystem services function of the wetlands would thus also include the protection of the downstream riverine areas (Berg River) from higher levels of sediment and nutrient input if these wetlands were lost.

The National Wetland Inventory v5.2 spatial data (NWI), confirmed the presence of the wetland areas. The observed aquatic systems due to the overall habitat degradation in the region are not included in any and National Freshwater Ecosystems Priority Areas (NFEPA), Wetland Clusters or Strategic Water Resources Areas.

The only dense riparian vegetation was found along reaches of the Berg River, dominated by sedges and grasses (*Cynodon dactylon, Cyperus spp, Phragmites australis*) on the river edge, while tall trees on the steep banks were dominated by alien species (*Acacia mearnsii & Eculayptus spp)*. The wetland areas were

dominated by sedges (*Ficinia littoralis, Juncus spp*) and various ruderal weeds and grass associated with the adjacent agricultural areas.

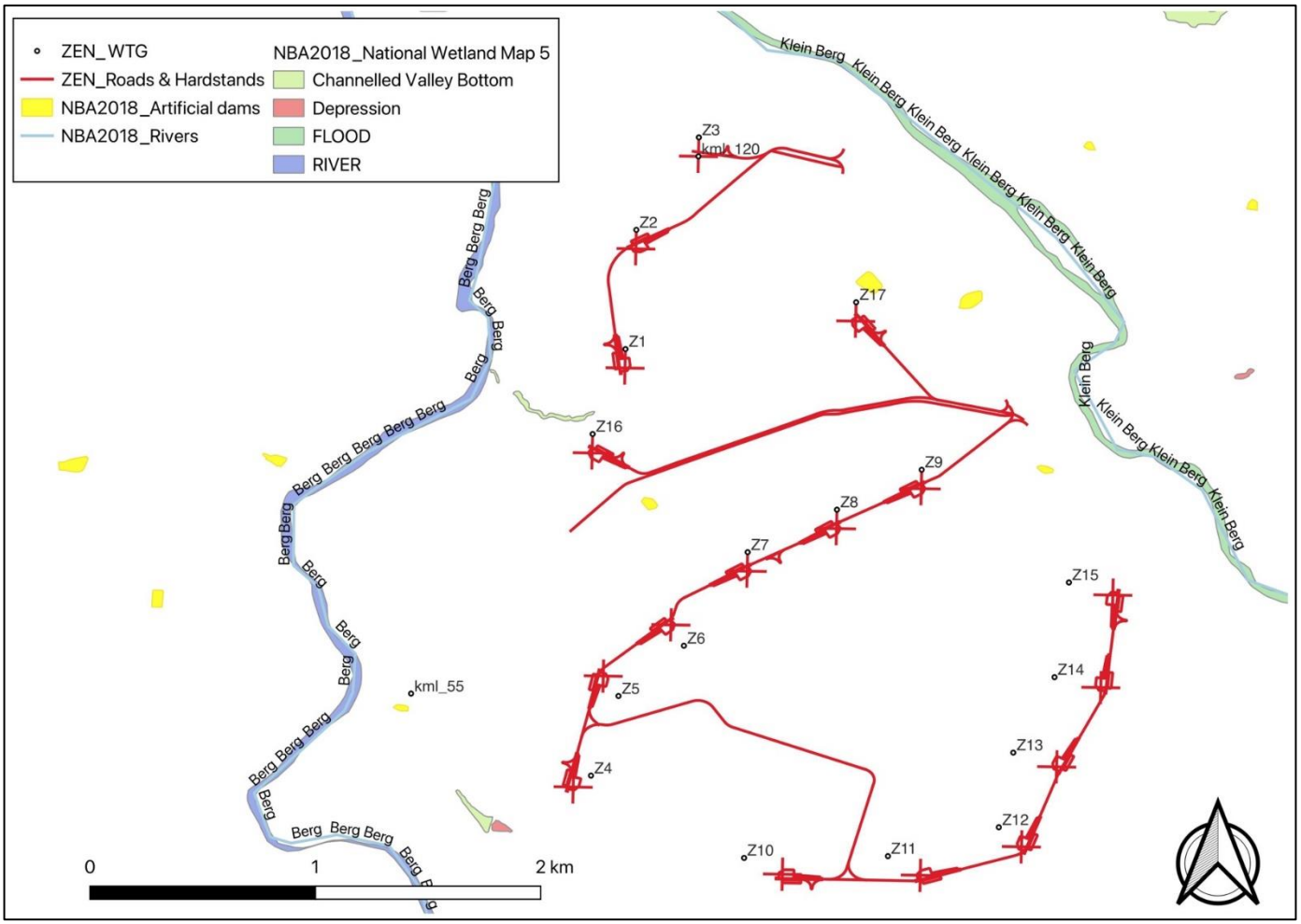


Figure 2: The various waterbodies identified in the National Wetland Inventory as shown in the National Spatial Biodiversity Spatial data

No aquatic species of special concern were observed within the development area during the time of the survey.

3. STORMWATER MANAGEMENT PRINCIPLES

In the design phase, various stormwater management principles should be considered including:

- Prevent concentration of stormwater flow at any point where the ground is susceptible to erosion.
- Reduce stormwater flows as far as possible by the effective use of attenuating devices (such as swales, berms, and silt fences). As construction progresses, the stormwater control measures are to be monitored and adjusted to ensure complete erosion and pollution control at all times.
- Silt traps must be used where there is a danger of topsoil or material stockpiles eroding and entering streams and other sensitive areas.
- Construction of gabions and other stabilisation features on steep slopes may be undertaken to prevent erosion, if deemed necessary.
- Minimise the area of exposed bare soils to minimise the erosive forces of wind, water and all forms of traffic.

- Ensure that development does not increase the rate of stormwater flow above that which the natural ground can safely accommodate at any point in the sub-catchments.
- Ensure that all stormwater control works are constructed in a safe and aesthetic manner in keeping with the overall development.
- Plan and construct stormwater management systems to remove contaminants before they pollute surface waters or groundwater resources.
- Contain soil erosion, whether induced by wind or water forces, by constructing protective works to trap sediment at appropriate locations. This applies particularly during construction.
- Avoid situations where natural or artificial slopes may become saturated and unstable, both during and after the construction process.
- Design and construct roads to avoid concentration of flow along and off the road. Where flow concentration is unavoidable, measures to incorporate the road into the pre-development stormwater flow should not exceed the capacity of the culvert. To assist with the stormwater run-off, gravel roads should typically be graded and shaped with a 2-3% cross fall back into the slope, allowing stormwater to be channelled in a controlled manner towards the natural drainage lines and to assist with any sheet flow on the project area.
- Design culvert inlet structures to ensure that the capacity of the culvert does not exceed the pre-development stormwater flow at that point. Provide detention storage on the road and/or upstream of the stormwater culvert.
- Design outlet culvert structures to dissipate flow energy. Any unlined downstream channel must be adequately protected against soil erosion.
- Where the construction of a building causes a change in the vegetative cover of the site that might result in soil erosion, the risk of soil erosion by stormwater must be minimised by the provision of appropriate artificial soil stabilisation mechanisms or re-vegetation of the area. Any inlet to a piped system should be fitted with a screen or grating to prevent debris and refuse from entering the stormwater system.
- Preferably all drainage channels on the project area and contained within the larger area of the property (i.e., including buffer zone) should remain in the natural state so that the existing hydrology is not disturbed.

3.1 Engineering Specifications

Detailed engineering specifications for a Stormwater Management Plan describing and illustrating the proposed stormwater control measures must be prepared by the Civil Engineers during the detailed design phase and should be based on the underlying principles of this Stormwater Management Guide. This should include erosion control measures. Requirements for project design include:

- Erosion control measures to be implemented before and during the construction period, including the final stormwater control measures (post construction).
- All temporary and permanent water management structures or stabilisation methods.
- The drainage system for the project area should be designed to specifications that can adequately deal with a 1:50 year intensity rainfall event or more to ensure sufficient capacity for carrying stormwater around and away from infrastructure.
- Procedures for stormwater flow through a project area need to take into consideration both normal operating practice and special circumstances. Special circumstances in this case typically include severe rainfall events.
- An on-site Engineer or Environmental Officer (EO) is to be responsible for ensuring implementation of the erosion control measures on site during the construction period.

» The Engineering, Procurement and Construction (EPC) Contractor holds ultimate responsibility for remedial action in the event that the approved stormwater plan is not correctly or appropriately implemented and damage to the environment is caused.

During the construction phase, the contractor must prepare a Stormwater Control Method Statement to ensure that all construction methods adopted on the project area do not cause, or precipitate soil erosion and shall take adequate steps to ensure that the requirements of the Stormwater Management Plan are met before, during and after construction. The designated responsible person on the project area, must be indicated in the Stormwater Control Method Statement and shall ensure that no construction work takes place before the relevant stormwater control measures are in place.

An operation phase Stormwater Management Plan should be designed and implemented if not already addressed by the mitigations implemented as part of construction, with a view to preventing the passage of concentrated flows off hardened surfaces and onto natural areas.

PRINCIPLES FOR EROSION MANAGEMENT

1. PURPOSE

Exposed and unprotected soils are the main cause of erosion in most situations. Therefore, this Erosion Management Plan, the Stormwater Management Plan and the Revegetation and Habitat Rehabilitation Plan are 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.

This Erosion Management Plan addresses the management and mitigation of potential impacts relating to soil erosion. The objective of the plan is to provide:

» A general framework for soil erosion and sediment control, which enables the contractor to identify areas where erosion can occur and is likely to be accelerated by construction related activities.
» An outline of general methods to monitor, manage and rehabilitate erosion prone areas, ensuring that all erosion resulting from all phases of the development is addressed.

This plan must be updated and refined once the construction/ civil engineering plans have been finalised following detailed design.

2. RELEVANT ASPECTS OF THE SITE

The Zen Wind Farm site falls entirely on soils that were classified as shallow duplex soils. During the verification visit, mostly Glenrosa profiles were identified in the area. These profiles range in depth between 100mm and 450mm and the orthic topsoil is underlain by geolithic material. In some areas Mispah soils are present. The Mispah soils range in depth between 50mm and 300 mm and the depth is limited by solid and fractured rock instead of lithic material.

Slight depressions in the fields consist of duplex soils and the higher clay content of these soils result in higher water-holding capacity and slower water infiltration rate. The site has a few of these depressions with stagnant water were observed. These areas have likely developed as a result of erosion over time as the duplex soils are highly erodible.

Duplex soils that were identified in these areas are Swartland soils. The Swartland soils consist of orthic topsoil that is mostly grey or bleached in colour and brown pedocutanic subsoil that has some vertic properties. The Swartland soils range in depth between 0.3m and 0.5m and is limited in effective depth by lithic material. The pedocutanic horizon is non-calcareous.

3. EROSION AND SEDIMENT CONTROL PRINCIPLES

The goals of erosion control during and after construction at the project area should be to:

» Protect the land surface from erosion.
» Intercept and safely direct run-off 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.

These goals can be achieved by applying the management practices outlined in the following sections.

3.1. On-Site Erosion Management

General factors to consider regarding erosion risk at the project area include the following:

- Reduction of a stable vegetation cover and associated below-ground biomass that currently increases soil surface porosity, water infiltration rates and thus improves the soil moisture availability. Without the vegetation, the soil will be prone to extensive surface capping, leading to accelerated erosion and further loss of organic material and soil seed reserves from the local environment.
- Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilisation. Therefore, the gap between construction activities and rehabilitation should be minimised. Phased construction and progressive rehabilitation, where practically possible, are therefore important elements of the erosion control strategy.
- The extent of disturbance will influence the risk and consequences of erosion. Therefore, site clearing should be restricted to areas required for construction purposes only. As far as possible, large areas should not be cleared all at once, especially in areas where the risk of erosion is higher.
- Roads should be planned and constructed in a manner which minimises their erosion potential. Roads should therefore follow the natural contour as far as possible. Roads parallel to the slope direction should be avoided as far as possible.
- Where necessary, new roads constructed should include water diversion structures with energy dissipation features present to slow and disperse the water into the receiving area.
- Roads used for project-related activities and other disturbed areas should be regularly monitored for erosion. Any erosion problems recorded should be rectified as soon as possible and monitored thereafter to ensure that they do not re-occur.
- Runoff may have to be specifically channelled or storm water adequately controlled to prevent localised rill and gully erosion.
- Compacted areas should have adequate drainage systems to avoid pooling and surface flow. Heavy machinery should not compact those areas which are not intended to be compacted as this will result in compacted hydrophobic, water repellent soils which increase the erosion potential of the area. Where compaction does occur, the areas should be ripped.
- All bare areas should be revegetated with appropriate locally occurring species, to bind the soil and limit erosion potential.
- Silt fences should be used where there is a danger of topsoil or material stockpiles eroding and entering streams and other sensitive areas.
- Gabions and other stabilisation features must be used on steep slopes and other areas vulnerable to erosion to minimise erosion risk as far as possible.
- Activity at the project area after large rainfall events when the soils are wet and erosion risk is increased should be reduced. No driving off of hardened roads should occur at any time, and particularly immediately following large rainfall events.
- Topsoil should be removed and stored in a designated area separately from subsoil and away from construction activities. Topsoil should be reapplied where appropriate as soon as possible in order to encourage and facilitate rapid regeneration of the natural vegetation in cleared areas.
- Regular monitoring of the project area for erosion problems during construction (on-going) and operation (at least twice annually) is recommended, particularly after large summer thunderstorms have been experienced. The Environmental Control Officer (ECO) will determine the frequency of monitoring based on the severity of the impacts in the erosion prone areas.

3.1.1 Erosion control mechanisms

The contractor may use the following mechanisms (whichever proves more appropriate/ effective) to combat erosion when necessary:

- Reno mattresses.
- Slope attenuation.
- Hessian material.
- Shade catch nets.
- Gabion baskets.
- Silt fences.
- Storm water channels and catch pits.
- Soil bindings.
- Geofabrics.
- Hydro-seeding and/or re-vegetating.
- Mulching over cleared areas.
- Boulders and size varied rocks.
- Tilling.

3.2 Engineering Specifications

A detailed engineering specifications Storm water Management Plan describing and illustrating the proposed stormwater control measures must be prepared by the Civil Engineers during the detailed design phase and should be based on the underlying principles of the Storm water Management Plan and this should include erosion control measures. Requirements for project design include:

- Erosion control measures to be implemented before and during the construction period, including the final storm water control measures (post construction).
- All temporary and permanent water management structures or stabilisation methods must be indicated within the Storm water Management Plan.
- An on-site Engineer or EO/ Safety, Health and Environment (SHE) Representative to be responsible for ensuring implementation of the erosion control measures on the project area during the construction period. The ECO should monitor the effectiveness of these measures on the interval agreed upon with the Site Manager and EO.
- The EPC Contractor holds ultimate responsibility for remedial action in the event that the approved Storm water Management Plan is not correctly or appropriately implemented and damage to the environment is caused.

3.3 Monitoring

The project area must be monitored continuously during construction and operation in order to determine any indications of erosion. If any erosion features are recorded as a result of the activities on-site the EO/ SHE Representative (during construction) or Environmental Manager (during operation) must:

- Assess the significance of the situation.
- Take photographs of the soil degradation.
- Determine the cause of the soil erosion.

- Inform the contractor/operator that rehabilitation must take place and that the contractor/operator is to implement a rehabilitation method statement and management plan to be approved by the Site/Environmental Manager in conjunction with the ECO.
- Monitor that the contractor/operator is taking action to stop the erosion and assist them where needed.
- Report and monitor the progress of rehabilitation weekly and record all the findings in a site register (during construction).
- All actions with regards to the incidents must be reported on a monthly compliance report which should be kept on file for if/when the Competent Authority requests to see it (during construction) and kept on file for consideration during the annual audits (during construction and operation).

The Contractor (in consultation with an appropriate specialist, e.g., an engineer) must:

- Select a system/mechanism to treat the erosion.
- Design and implement the appropriate system/mechanism.
- Monitor the area to ensure that the system functions like it should. If the system fails, the method must be adapted or adjusted to ensure the accelerated erosion is controlled.
- Continue monitoring until the area has been stabilised.

Appendix E:

Waste Management Plan

WASTE MANAGEMENT PLAN

1. PURPOSE

A Waste Management Plan (WMP) plays a key role in achieving sustainable waste management throughout all phases of the project. The plan prescribes measures for the collection, temporary storage and safe disposal of the various waste streams associated with the project and includes provisions for the recovery, re-use and recycling of waste. The purpose of this plan is therefore to ensure that effective procedures are implemented for the handling, storage, transportation and disposal of waste generated from the project activities on site.

This WMP has been compiled as part of the project EMPr and is based on waste stream information available at the time of compilation. Construction and operation activities must be assessed on an ongoing basis in order to determine the efficacy of the plan and whether further revision of the plan is required. This plan should be updated should further detail regarding waste quantities and categorisation become available, during the construction and/or operation stages.

2. RELEVANT ASPECTS OF THE SITE

It is expected that the development of the Zen Wind Farm will generate construction solid waste, general waste and hazardous waste during the lifetime of the wind farm.

Waste generated on site, originates from various sources, including but not limited to:

- Concrete waste generated from spoil and excess concrete.
- Contaminated water, soil, rocks and vegetation due to hydrocarbon spills.
- Hazardous waste from vehicle, equipment and machinery parts and servicing, fluorescent tubes, used hydrocarbon containers, and waste ink cartridges.
- Recyclable waste in the form of paper, glass, steel, aluminium, wood/ wood pallets, plastic (PET bottles, PVC, LDPE) and cardboard.
- Organic waste from food waste as well as alien and endemic vegetation removal.
- Sewage from portable toilets and septic tanks.
- Inert waste from spoil material from site clearance and trenching works.

3. LEGISLATIVE REQUIREMENTS

Waste in South Africa is currently governed by several regulations, including:

- National Environmental Management: Waste Act (NEM:WA), 2008 (Act 59 of 2008);
- National Environmental Management: Waste Amendment Act, 2014 (Act 26 of 2014);
- The South African Constitution (Act 108 of 1996);
- Hazardous Substances Act (Act 5 of 1973);
- Health Act (Act 63 of 1977);
- Environment Conservation Act (Act 73 of 1989);
- Occupational Health and Safety Act (Act 85 of 1993);
- National Water Act (Act 36 of 1998);
- The National Environmental Management Act (Act 107 of 1998) (as amended);

- Municipal Structures Act (Act 117 of 1998);
- Municipal Systems Act (Act 32 of 2000);
- Mineral and Petroleum Resources Development Act (Act 28 of 2002); and
- Air Quality Act (Act 39 of 2004).

Storage of waste must be conducted in accordance with the National Norms and Standards for the Storage of Waste, published in GNR 926.

4. WASTE MANAGEMENT PRINCIPLES

An integrated approach to waste management is needed on site. Such an approach is illustrated in **Figure 1**.

It is important to ensure that waste is managed with the following objectives in mind during all phases of the project:

- Reducing volumes of waste is the greatest priority;
- If reduction is not feasible, the maximum amount of waste is to be recycled; and
- Waste that cannot be recycled is to be disposed of in the most environmentally responsible manner.

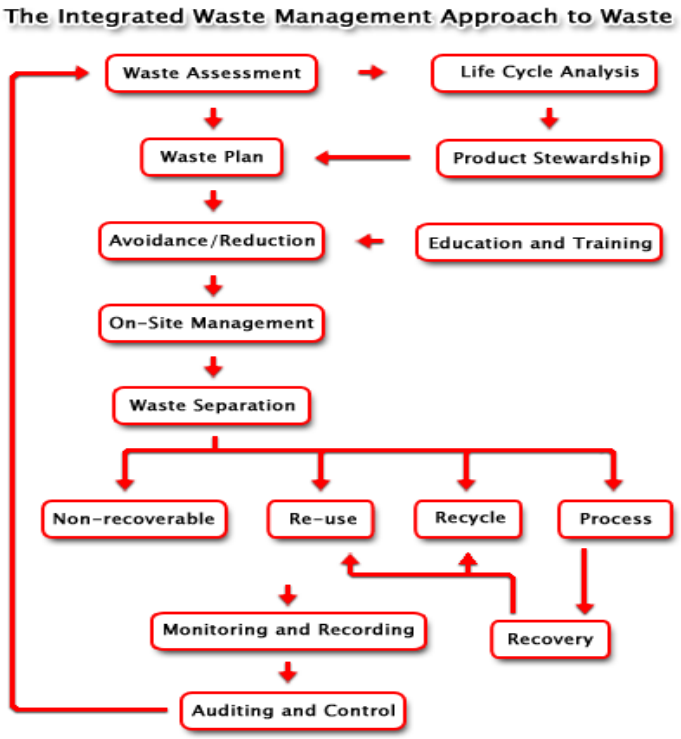


Figure 1: Integrated Waste Management Flow Diagram
(Source: http://www.enviroserv.co.za/pages/content.asp?SectionId=496)

4.1. Construction phase

A plan for the management of waste during the construction phase is detailed below. A Method Statement detailing specific waste management practices during construction should be prepared by the Contractor prior to the commencement of construction, for approval by the Resident Engineer and/or ECO.

4.1.1. Waste Assessment / Inventory

- The Environmental Officer (EO), or designated staff member, must develop, implement and maintain a waste inventory reflecting all waste generated during construction for both general and hazardous waste streams.
- Construction methods and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities, to be pro-actively implemented.
- Once a waste inventory has been established, targets for the recovery of waste (minimisation, re-use, recycling) should be set.
- The EO must conduct waste classification and rating in terms of SANS 10288 and Government Notice 634 published under the NEM: WA.

4.1.2. Waste collection, handling and storage

- It is the responsibility of the EO to ensure that each subcontractor implements their own waste recycling system, i.e. separate bins for food waste, plastics, paper, wood, glass cardboard, metals, etc. Such practises must be made contractually binding upon appointment of the subcontractors.
- Waste manifests and waste acceptance approvals (i.e. receipts) from designated waste facilities must be kept on file at the site office, in order to record and prove continual compliance for future auditing.
- Septic tanks and portable toilets must be monitored by the EO or responsible subcontractor and maintained regularly. Below ground storage of septic tanks must withstand the external forces of the surrounding environment. The area above the tank must be demarcated to prevent any vehicles or heavy machinery from moving around in the surrounding area.
- Waste collection bins and hazardous waste containers must be provided by the principal contractor and subcontractors and placed at strategic locations around the site for the storage of organic, recyclable and hazardous waste.
- A dedicated waste area must be established on site for the storage of all waste streams before removal from site. The storage period must not trigger listed waste activities as per the NEMWA, GN 921 of November 2013.
- Signage/ colour coding must be used to differentiate disposal areas for the various waste streams (i.e. paper, cardboard, metals, food waste, glass etc.).
- Hazardous waste must be stored within a bunded area constructed according to SABS requirements, and must ensure complete containment of the spilled material in the event of a breach. As such, appropriate bunding material, design, capacity and type must be utilised to ensure that no contamination of the surrounding environment will occur despite a containment breach. The net capacity of a bunded compound in a storage facility should be at least 120% of the net capacity of the largest tank.
- Take into consideration the capacity displaced by other tanks within the same bunded area and any foundations.

- Treat interconnected tanks as a single tank of equivalent total volume for the purposes of the bund design criteria
- The location of all temporary waste storage areas must aim to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control, while being reasonably placed in terms of centrality and accessibility on site. Where required, an additional temporary waste storage area may be designated, provided identical controls are exercised for these locations.
- Waste storage shall be in accordance with all Regulations and best-practice guidelines and under no circumstances may waste be burnt on site.
- A dedicated waste management team must be appointed by the principal contractors' SHE Officer, who will be responsible for ensuring the continuous sorting of waste and maintenance of the area. The waste management team must be trained in all areas of waste management and monitored by the SHE Officer.
- All waste removed from site must be done by a registered/ licensed subcontractor, who must supply information regarding how waste recycling/ disposal will be achieved. The registered subcontractor must provide waste manifests for all removals at least once a month or for every disposal made, records of which must be kept on file at the site camp for the duration of the construction period.

4.1.3. Management of waste storage areas

- The position of all waste storage areas must be located so as to ensure minimal degradation to the environment. The main waste storage area must have a suitable stormwater system separating clean and contaminated stormwater.
- Collection bins placed around the site and at subcontractors' camps (if at a different location than the main site camp) must be maintained and emptied on a regular basis by the principal contractor to avoid overflowing receptacles.
- Inspections and maintenance of the main waste storage area must be undertaken daily. Skips and storage containers must be clearly marked or colour coded and well-maintained. Monitor for rodents and take corrective action if they become a problem.
- Waste must be stored in designated containers and not on the ground.
- Inspections and maintenance of bunds must be undertaken regularly. Bunds must be inspected for leaks or cracks in the foundation and walls.
- It is assumed that any rainwater collected inside the bund is contaminated and must be treated by oil/water separation (or similar method) prior to dewatering, or removed and stored as hazardous waste, and not released into the environment.
- If any leaks occur in the bund, these must be removed immediately.
- Bund systems must be designed to avoid dewatering of contaminated water, but to rather separate oil and hydrocarbons from water prior to dewatering.
- Following rainfall event bunds must always be dewatered in order to maintain a sufficient storage capacity in the event of a breach.
- No mixing of hazardous and general waste is allowed.

4.1.4. Disposal

- Waste generated on site must be removed on a regular basis. This frequency may change during construction depending on waste volumes generated at different stages of the construction process,

however removal must occur prior to the storage capacity being reached to avoid overflow of containers and poor waste storage.
» Waste must be removed by a suitably qualified contractor and disposed of at an appropriately licensed landfill site. Proof of appropriate disposal must be provided by the contractor to the EO and ECO.

4.1.5. Record keeping

The success of the Waste Management Plan is determined by measuring criteria such as waste volumes, cost recovery from recycling and cost of disposal. Recorded data can indicate the effect of training and education, or the need for education. It will provide trends and benchmarks for setting goals and standards. It will provide clear evidence of the success or otherwise of the plan.

» Documentation (waste manifest, certificate of issue or safe disposal) must be kept detailing the quantity, nature, and fate of any regulated waste for audit purposes.
» Waste management must form part of the monthly reporting requirements in terms of volumes generated, types, storage and final disposal.

4.1.6. Training

Training and awareness regarding waste management shall be provided to all employees and contractors as part of the toolbox talks or on-site awareness sessions with the EO and at the frequency as set out by the ECO.

4.2. Operation phase

It is expected that the operation phase will result in the production of limited amounts of general waste consisting mostly of cardboard, paper, plastic, tins, metals and a variety of synthetic compounds. Hazardous wastes (including grease, oils) will also be generated. All waste generated will be required to be temporarily stored at the facility in appropriate sealed containers prior to disposal at a permitted landfill site or other facilities.

The following waste management principles apply during the operation phase:

» The SHE Manager must develop, implement and maintain a waste inventory reflecting all waste generated during operation for both general and hazardous waste streams.
» Adequate waste collection bins at site must be supplied. Separate bins should be provided for general and hazardous waste.
» Recyclable waste must be removed from the waste stream and stored separately.
» All waste must be stored in appropriate temporary storage containers (separated between different operation wastes, and contaminated or wet waste).
» Waste storage shall be in accordance with all best-practice guidelines and under no circumstances may waste be burnt on site.
» Waste generated on site must be removed on a regular basis throughout the operation phase.
» Waste must be removed by a suitably qualified contractor and disposed at an appropriately licensed landfill site. Proof of appropriate disposal must be provided by the contractor and kept on site.

5. Monitoring of Waste Management Activities

Records must be kept of the volumes/ mass of the different waste streams that are collected from the site throughout the life of the project. The appointed waste contractor is to provide monthly reports to the operator containing the following information:

- Monthly volumes/ mass of the different waste streams collected;
- Monthly volumes/ mass of the waste that is disposed of at a landfill site;
- Monthly volumes/ mass of the waste that is recycled;
- Data illustrating progress compared to previous months.

This report will aid in monitoring the progress and relevance of the waste management procedures that are in place. If it is found that the implemented procedures are not as effective as required, this WMP is to be reviewed and amended accordingly. This report must from part of the EO's reports to the ECO on a monthly basis.

Appendix F:
Material Handling

HANDLING, MANAGEMENT AND MONITORING OF HAZARDOUS SUBSTANCES

1. PURPOSE

The purpose of the Plan for the handling, management and monitoring of hazardous substances is:

» To provide an effective handling, management and monitoring system for early detection of leakage or spillage of all hazardous substances during their transportation, handling, use and storage.
» To assist contractor personnel to prepare for and respond quickly and safely to emergency incidents, and to establish a state of readiness which will enable prompt and effective responses to possible events.
» To control or limit any effect the handling, management and monitoring of hazardous substances of may have on site or on neighbouring areas.
» To facilitate emergency responses and to provide such assistance on the site as is appropriate to the occasion.
» To ensure communication of all vital information as soon as possible.
» To provide for training so that a high level of preparedness can be continually maintained.

2. PROJECT-SPECIFIC SCOPE

All chemical substances used during any of the activities during the construction and/or operation of all installations.

2.1. Definitions

Hazardous Substance: Substances that have one of the following intrinsic characteristics: corrosive, explosive, flammable, pathogenic or bio-infectious, radioactive, reactive and toxic, in accordance with the current chemical substance legislation.
Material Safety Data Sheet (MSDS): Document that contains the information required for the correct use of the product and which the supplier must provide.
Yellow Safety Sheet (YSS): documents that summaries the most relevant aspects of the Safety Files (SFs), to provide access to the information to all staff. These will be prepared following the prescribed format, and must be printed on yellow paper.

2.2. Chemical substance inventory

The installation's supervisor will be responsible for the following, with the assistance of the QSE Dep., in all installations where chemical substances are used:

- Maintaining the inventory updated,
- Gathering the MSDS of all chemical substances in the inventory and having them accessible to their users.

2.3 Use and storage of chemical substances

Chemical substances will be used and stored in compliance with the recommendations of the SFs, as well as any applicable internal instructions.
The installation supervisor must:

- Prepare the Yellow Safety Sheets with the assistance of the QSE Department for the corresponding substances and make them available to their users where these substances are used.
- Guarantee the identification of fixed tanks and mobile containers. In the case of Hazardous substances, include the pictogram on the container/tank, as established in section xx (Chemical Safety Pictogram).
- Guarantee the adequate training of the users of chemical substances, with the assistance of the QSE Department.
- Supply the adequate PPE (in accordance with the MSDS and Risk Assessment) required to handle such substances.
- Make sure that the hygienic measurements proposed by the Risk Assessment procedures are carried out, with the assistance of the QSE Department.
- Prepare the substance handling instructions for specific substances that are particularly dangerous and/or because of their volume, with the assistance of the QSE Department.
- Make sure that all warehouses and storage places are legalised and that they comply with the current legislation (for emissions to air, oil installations, gaseous fuel Regulations).

2.4 Transporting, loading and unloading hazardous substances

In the event of loading, unloading and/or transporting hazardous chemical substances, the installation's supervisor must make sure that these activities comply with the legislation, with the assistance of the QSE Department.

3 Guide for the carriage of dangerous goods and hazardous substances

3.1. People Involved in Carriage Operations and their Responsibilities

The personnel involved are: **Loader/Filler**, **Consignee**, **Carrier**, **Consignor and Packer.**

The table below explains the corresponding responsibilities:

Figure	Responsibilities
Loader (of packages)	This refers to all companies physically undertaking the loading in the vehicles or containers of dangerous goods arranged in a number of packages. Main functions: a) The company will only deliver the dangerous goods to the carrier if these ones are authorized for their carriage according to the Locals Transportation Regulations; b) When the company places dangerous packed goods or empty packings without cleaning them before transportation, they shall verify that they are not damaged or prevent any spillage. They will not deliver it to the carrier if they are damaged -and, especially, if they are not hermetic and if there is a risk of leakage for the dangerous goods- until the damages have been rectified. c) When they load the dangerous goods in a vehicle or container, they shall observe the particular provisions regarding the loading and handling; d) Once the dangerous goods are loaded in a container, they shall respect the provisions regarding the danger signs; e) When they load the packages, they shall observe the prohibitions of mixed load by considering at the same time the dangerous goods already present in the vehicle -or large

	container- as well as the provisions regarding the separation of food products, other consumption objects or animal food.
Filler operator (tank-vehicles loader)	This refers to all companies transferring dangerous goods in bulk from the storage reservoirs to the tank-vehicles. Main functions: a) Before filling the tank-vehicles, they shall ensure that these ones and their equipments are in good technical conditions; b) They shall ensure that the next vehicles and tanks inspection date has not expired; c) They will be only entitled to fill the tank-vehicles with dangerous goods that are authorized for their carriage in said tanks. d) During the filling of the tank-vehicles, they shall observe any provisions regarding the dangerous goods in adjacent compartments; e) During the filling of the tank-vehicles, they shall observe the maximum admissible filling rate or the maximum admissible weight for the container per capacity litre for the filling goods; f) Once the tank-vehicle has been filled, they shall verify that the locking devices are hermetic; g) They shall ensure that any dangerous waste of the filling good remains adhered to the outer surface of the tank-vehicles that have been filled with it; h) When they prepare the dangerous goods for their carriage, they shall ensure that the orange plates and the set labels are in place according to the provisions on tank-vehicles, on vehicles and on containers for bulk goods.
Recipient	This refers to the company appearing as such in the transport document. If there is no written document defining it, it refers to the company in charge of the dangerous goods at their arrival. Main functions: a) In the cases where the Locals Transportation Regulations includes the set cleaning and decontamination of vehicles and containers, it shall be given, in practice, a no load transport document to the carrier so that the vehicle can be taken to an authorized washing company or can be reloaded with the same product. b) To ensure that the containers, once completely unloaded, clean and decontaminated, do not carry any danger sign.
Carrier	This refers to the company performing the carriage, although it is not specified on a contract. Main functions: a) To verify that the dangerous goods to be transported are authorized for their carriage according to the Locals Transportation Regulations; b) To ensure that the indicated documentation is present on board of the carriage unit; c) To visually ensure that the vehicles and load do not have any faults, leakages or fissures, that there are no equipment devices lacking, etc. d) To ensure that the next vehicles and tanks inspection date has not expired; e) To verify that the vehicles are not overloaded; f) To ensure that the danger labelling and the set signs for vehicles are all in place; g) To ensure that the vehicles indicated on the driver written instructions are present on board of the vehicle.
Consignor	This refers to the company shipping dangerous goods for itself or a third party. They appear as such in the transport document. In practice, they are the ones contracting the carriage. Main functions: a) To ensure that the dangerous goods are classified and authorized to the carriage according to the Locals Transportation Regulations; b) To supply to the carrier the necessary indications and information and, when applicable, the transport document and any other documentation accompanying it (authorizations, consents, notifications, certificates, etc.) required; c) To only use packagings, packings, large packings, large containers for bulk goods, and admitted and suitable tank-vehicles for the carriage of the involved goods and with the marking indicated in the Locals Transportation Regulations; d) To observe the provisions on the mode of consignment and on the shipping constraints; e) To ensure that even the empty tank-vehicles that have not been cleaned up or degassed are marked and labelled in a compliant way and that the empty tank-vehicles that have not been cleaned up are closed and have the same tightness warranties as when they are full.
Packer	This refers to the company that places the dangerous goods in packagings or packings and prepares the bulks to be loaded and transported. Main functions: a) The provisions regarding packing and mixed packing conditions; and

	b) When they prepare the packages to be carried, they must observe provisions on the package dangerous marking and labelling.

3.2. Security Advisor

All companies transporting, packaging/bottling/canning, loading and/or unloading non-exempt quantities of hazardous goods, must appoint an accredited Safety Adviser, who will be responsible to, inter alia:

- Identify all the dangerous goods loaded and/or unloaded under their responsibility
- Verify that all the received and consigned dangerous goods are properly packaged.
- Mark and label all the dangerous goods that they package.
- Use appropriate means of loading and unloading (hoses, reservoirs, platform trucks, cranes, warehouses, etc.) And subject to preventive maintenance
- Assess subcontracted third parties and verify that they fulfil their responsibilities in dangerous goods operations
- Carry out controls, verifications, checks of all the security issues to be monitored before, during and after the loading and unloading operations
- Define the actuations to be followed in the event of an emergency during the loading and/or unloading, regarding personal accidents, material and environmental damages and product losses and/or accident communications to third parties
- Implant works procedures defining how to properly carry out the loading/unloading/packaging/shipping/carriage operations of dangerous goods and how to properly perform the loading and unloading checks.
- Train all the personnel involved concerning the risks of goods, the security issues related to the goods and specific operations (loading/unloading/packaging/shipping/carriage)
- Submit an annual report to the relevant organization and keep record of all their activities for evidence in case of inspection.

3.3. Identification of Dangerous Goods

All dangerous goods are identified by means of a series of codes. Said nomenclature must appear on the "Transport documents".

- **Code number**: number assigned by the code number to a substance/object, a group of substances/objects or a family of substances/objects that are considered as dangerous for their carriage
- **Official Name**: it is the name to be used in documentation and labelling, as it appears on the Locals Transportation Regulations (in no case will the trademarks be valid)
- **Class**: it is the name identifying the preponderant hazard class in dangerous goods (flammables, corrosive, toxic, explosive, etc.)
- **Packing group:** Roman number related to the goods hazard rating degree: 3 degrees (very dangerous, dangerous, slightly dangerous)
- **Warning label/s number**: associated to each hazard present in the same dangerous goods.
- **Other properties**: usually related to physico-chemical properties (flash point, vapour pressure), concentrations and other defining parameters.

4 SIGNAGE

Pictograms that show the labels used to identify the containers (fixed tanks and mobile containers) that are carrying hazardous substances must be utilised.

4.1. Pictograms - Globally Harmonized System of Classification and Labeling of Chemicals

PHYSICAL HAZARD PICTOGRAM.	
	All substances and preparations that, at an ambient temperature and pressure, are flammable in contact with the air.
	Pressure gases: compressed gas, liquefied gas, refrigerated liquefied gas, dissolved gas.
	All substances and preparations that, in contact with other substances, especially with flammable substances, produce a highly exothermic reaction.
	Substances and elements that can destroy the skin after direct contact and cause serious eye injuries. Substances and mixes that are corrosive to other metals.
	All substances and preparations that may react in certain conditions -even in absence of air oxygen- by detonating or easily deflagrating or, in hot conditions and in case of partial confinement, by exploding.
HEALTH HAZARD PICTOGRAMS	
	Acute oral, skin, inhalation toxicity
	Mutagenic, carcinogenic, toxic for reproduction
	Acute oral, skin, inhalation toxicity. Eye and skin irritation, skin sensitivity and irritation of the respiratory tract. Narcotic effects.

PHYSICAL HAZARD PICTOGRAM.	
	Acute and chronic hazards for the aquatic environment.

4.2. Summary chart of storage incompatibilities of hazardous substances

	 I				 H340 H350 H360 H370 H372 I	 H341 H351 H361 H371 H373			
	✔	✘	✘	✘	✘	✔	✔	✔	✔
	✘	✔	✘	✘	✘	✘	✘	✘	✔
	✘	✘	✔	✘	✔	✔	✔	✔	✔
 H341,H351,H361 H371,H373	✔	✘	✔	o	✔	✔	✔	✔	✔
 H340,H350,H360 H370, H372	✘	✘	✔	✘	✔	✔	✔	✔	✔
	✘	✘	✘	✔	✘	o	o	o	✔
	✔	✘	✔	o	✔	✔	✔	✔	✔
	✔	✘	✔	o	✔	✔	✔	✔	✔
	✔	✔	✔	✔	✔	✔	✔	✔	✔

✔ May be stored together
o May be stored together only if specific prevention measures are taken
✘ Must not be stored together

I The product with the  hazard sign stated in phrase H stated on the Safety File can be stored with other products, in accordance with the dangerousness of the latter.

5 RELATED DOCUMENTATION

The following documentation must be prepared for the site prior to construction commencing, and be available for review.

Title
Chemical substance Inventory
Yellow Safety Sheet
Chemical Safety Pictogram
Chemical Substance Inventory Guide
Goods Transport Guide
Storage of Chemical Substances in Mobile Containers

Appendix G:
Traffic Management Plan

PRINCIPLES FOR TRAFFIC MANAGEMENT

1. PURPOSE

The purpose of this Traffic Management Plan (TMP) is to address regulatory compliance, traffic management practices, and protection measures to help reduce impacts related to transportation and the construction of temporary and long-term access within the vicinity of the Zen Wind Farm project site. The objectives of this plan include the following:

- To ensure compliance with all legislation regulating traffic and transportation within South Africa (National, Provincial, Local & associated guidelines).
- To avoid incidents and accidents while vehicles are being driven and while transporting personnel, materials, and equipment to and from the project site.
- To raise greater safety awareness in each driver and to ensure the compliance of all safe driving provisions for all the vehicles.
- To raise awareness to ensure drivers respect and follow traffic regulations.
- To avoid the deterioration of access roads and the pollution that can be created due to noise and emissions produced by equipment, machinery, and vehicles.

2. ASPECTS RELEVANT TO THE ZEN WIND FARM PROJECT

The Zen Wind Farm is located between the towns of Gouda to the south and Saron to the north with Truck Road 23/3 running through the properties. Access to the site will be obtained from Trunk Road 23/3 (R44). Main access points to the site may have to be upgraded in order to be able to accommodate, the extra-long and wide vehicles with their loads. The road surface of any access point should include a permanent surface for at least the section within the road reserve of Trunk Road 23/3.

Traffic is not expected to result in any flow problems at the access point. It will, however, have to be ensured that proper permanent road signs and markings in accordance with the South African Development Community Road Traffic Signs Manual be provided in the vicinity of the access.

The following is required to be noted and considered as part of a traffic, transport and logistics plan:

- Properties under discussion are situated to the south of Saron and north of Gouda and that access will be obtained directly from Trunk Road 23/3 (R44).
- As a result of possible insufficient vertical clearances at the bridges across Minor Road 7645 the route of transport for the nacelles and hubs might have to be diverted onto Main Road 559, then left onto Main Road 233 to join the same route as for the blades at the intersection of Main Road 233 with Trunk Road 77/1;
- Except for some telephone / electrical poles and lines as well as traffic signs that will have to be temporarily removed, there are no other structures/road furniture obscuring the way of the abnormal heavy vehicle transporting the components to the wind farm;
- Access points will have to be upgraded in order to accommodate the abnormal heavy vehicles with their loads;
- The total distance of the route from Saldanha Harbour to the site is approximately 150 km;

- Traffic volumes along Trunk Road 23/3 is reasonably spread out during the day with no noticeable peak hours;
- No serious traffic flow problems are expected at the access points to the wind farm during the construction phase as the abnormal heavy vehicle transporting the components will be escorted and the escorts will have to regulate the traffic on Trunk Road 23/3 while these abnormal heavy vehicles enter the proposed wind farm; and
- Very little traffic and mostly light vehicles will be used for the normal maintenance on the wind turbines as soon as it is in operation and that no problems with regard to traffic flow is therefore expected.

3. TRAFFIC AND TRANSPORTATION MANAGEMENT PRINCIPLES

- Prior to the commencement of construction the contractor must develop their own detailed Transport Management Plan (TMP) based on traffic volumes and road carry capacity outlines.
- The transport contractor must ensure that all required permits for the transportation of abnormal loads are in place prior to the transportation of equipment and project components to the project site. Specific abnormal load routes must be developed with environmental factors taken into consideration.
- Before construction commences, authorised access routes must be clearly marked in the field with signs or flagging.
  - Traffic signs used must conform to the National Road Traffic Act and South African National Standards.
  - Appropriate signs must be installed at locations as deemed necessary.
  - Signage must be placed at intersections, speed limit alterations, severe changes in road grading, where road hazards are located and where usual traffic flow changes abruptly.
  - All traffic signs must be obeyed by all staff and visitors on site, without exception.
- The EPC Contractor must review the location of the designated access and will be responsible for ensuring construction travel is limited to designated routes. The entrance of the main access road must not be constructed before a blind rise or on a bend of the public road.
- All employees must attend an environmental training program (e.g. toolbox talks) by the Environmental Officer (EO). Through this program, employees will be instructed to use only approved access roads, drive within the delineated road limits, and obey jurisdictional and posted speed limits to minimise potential impacts to the environment and other road users.
- The contractor will be responsible for making sure that their suppliers, vendors, and subcontractors strictly comply with the principles of this TMP and the contractor's TMP.
- Adjacent landowners must be notified of the construction schedule.
- Access roads and entrances to the site should be carefully planned to limit any intrusion on the neighbouring property owners and road users.
- Signs must be posted in the project area to notify landowners and others of the construction activity.
- Flagging must be provided at access points to the project site and must be maintained until construction is completed on the site.
- Speed limits must be established prior to commencement of construction and enforced for all construction traffic. The following limits are suggested for internal roads:
  - 60 km/hour where sign posted.
  - 40 km/hour where sign posted.
  - 20km/hour around workshop areas, in all car parks and yards.
  - A warning system, penalties or fines must be put in place where speed limits are not adhered to.
- Speed controls and implementation of appropriate dust suppression measures must be enforced to minimise dust pollution.

- Throughout construction the contractor will be responsible for monitoring the condition of roads used by project traffic and for ensuring that roads are maintained in a condition that is comparable to the condition they were in before the construction began.
- Inspect traffic/road signs regularly for cleanliness, condition and appropriateness. Take immediate action to rectify any problems with signage.
- Drivers must have an appropriate valid driver's license and other operation licences required by applicable legislation.
- All vehicles must be maintained in good mechanical, electrical, and electronic condition, including but not limited to the brake systems, steering, tires, windshield wipers, side mirrors and rear view mirror, safety belts, signal indicators, and lenses.
- Any traffic delays attributable to construction traffic must be co-ordinated with the appropriate authorities.
- No deviation from approved transportation routes must be allowed, unless roads are closed for reasons outside the control of the contractor.
- Impacts on local communities must be minimised. Consideration should be given to limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time.
- A driver must not use the vehicle's horn except on the grounds of safety.
- Drivers of vehicles must always keep to the left and must be observant of other road users.
- Drivers must follow communication procedures and shall where applicable be trained in the correct use of two-way radios.
- Ensure all staff are trained upon entering the site regarding the meaning and correct response to each traffic sign utilised on site.
- All light vehicles must be fitted with a flashing amber strobe or revolving light.
- Persons authorized to operate on site must have a legal valid appropriate code provincial driver's license and competency certificate where applicable.
- No passengers allowed in any construction vehicles. If an assistant is required, they must obtain permission
- Vehicles must be maintained at approved intervals and must be inspected daily before use to ensure safe operation.
- All vehicles must only be used within the design specifications and limits set by the manufacturer.
- All construction vehicles will be used according to the Health & Safety Plan and related Method Statements and/or Risk Assessments.
- Weather and road conditions must be sufficient to allow safe operation to proceed. Head lights must be turned on at all times.
- No vehicle will be driven with any defect that may impact on the safe operation of that vehicle.
- Two-way radios shall only be used for official/work related matters.
- The use of mobile phones while driving a vehicle is prohibited.
- All vehicles shall carry a fire extinguisher (Dry Powder); 2.5kg for light vehicles, 4.5kg for haul trucks and 9kg for machinery.

4. MONITORING

- The principal contractor must ensure that all vehicles adhere to the speed limits.
- A speeding register must be kept with details of the offending driver.
- Repeat offenders must be penalised.

Appendix H:

Grievance Mechanism for Public Complaints and Issues

GRIEVANCE MECHANISM / PROCESS

PURPOSE

This Grievance Mechanism has been developed to receive and facilitate the resolution of concerns and grievances regarding the project's environmental and social performance. The aim of the grievance mechanism is to ensure that grievances or concerns are raised by stakeholders and to ensure such grievances are addressed in a manner that:

- Provides a predictable, accessible, transparent, and credible process to all parties, resulting in outcomes that are fair and equitable, accountable and efficient.
- Promotes trust as an integral component of broader community relations activities.
- Enables more systematic identification of emerging issues and trends, facilitating corrective action and pre-emptive engagement.

The aim of this Grievance Mechanism is to address grievances in a manner that does not require a potentially costly and time-consuming legal process.

PROCEDURE FOR RECEIVING AND RESOLVING GRIEVANCES

The following proposed grievance procedures are to be complied with throughout the construction, operation and decommissioning phases of the project:

- Local landowners, communities and authorities must be informed in writing by the Developer of the grievance mechanism and the process by which grievances can be brought to the attention of the Developer through its designated representative. This must be undertaken with the commencement of the construction phase.
- A company representative must be appointed as the contact person in order for grievances to be addressed. The name and contact details of the contact person must be provided to local landowners, communities and authorities when requested.
- Project related grievances relating to the construction, operation and or decommissioning phases must be addressed in writing to the contact person. The contact person should assist local landowners and or communities who may lack resources to submit/prepare written grievances, by recording grievances and completing written grievance notices where applicable, translating requests or concerns or by facilitating contact with the nominated contact person. The following information should be obtained, as far as possible, regarding each written grievance, which may act as both acknowledgement of receipt as well as record of grievance received:
    a. The name and contact details of the complainant;
    b. The nature of the grievance;
    c. Date raised, received, and for which the meeting was arranged;
    d. Persons elected to attend the meeting (which will depend on the grievance); and
    e. A clear statement that the grievance procedure is, in itself, not a legal process. Should such avenues be desired, they must be conducted in a separate process and do not form part of this grievance mechanism.
- The grievance must be registered with the contact person who, within 2 working days of receipt of the grievance, must contact the Complainant to discuss the grievance and, if required, agree on suitable

date and venue for a meeting in order to discuss the grievances raised. Unless otherwise agreed, the meeting should be held within 2 weeks of receipt of the grievance.

- The contact person must draft a letter to be sent to the Complainant acknowledging receipt of the grievance, the name and contact details of Complainant, the nature of the grievance, the date that the grievance was raised, and the date and venue for the meeting (once agreed and only if required).
- A grievance register must be kept on site (in electronic format, so as to facilitate editing and updating), and shall be made available to all parties wishing to gain access thereto.
- Prior to the meeting being held the contact person must contact the Complainant to discuss and agree on the parties who should attend the meeting, as well as a suitable venue. The people who will be required to attend the meeting will depend on the nature of the grievance. While the Complainant and or Developer are entitled to invite their legal representatives to attend the meeting/s, it should be made clear to all the parties involved in the process that the grievance mechanism process is not a legal process, and that if the Complainant invites legal representatives, the cost will be their responsibility. It is therefore recommended that the involvement of legal representatives be limited as far as possible, as a matter of last resort, and that this process be primarily aimed at stakeholder relationship management as opposed to an arbitration or litigation mechanism.
- The meeting should be chaired by the Developer's representative appointed to address grievances. The Developer must supply and nominate a representative to capture minutes and record the meeting/s.
- Draft copies of the minutes must be made available to the Complainant and the Developer within 5 working days of the meeting being held. Unless otherwise agreed, comments on the Draft Minutes must be forwarded to the company representative appointed to manage the grievance mechanism within 5 working days of receipt of the draft minutes.
- The meeting agenda must be primarily the discussion of the grievance, avoidance and mitigation measures available and proposed by all parties, as well as a clear indication of the future actions and responsibilities, in order to put into effect the proposed measures and interventions to successfully resolve the grievance.
- In the event of the grievance being resolved to the satisfaction of all the parties concerned, the outcome must be recorded and signed off by the relevant parties. The record should provide details of the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.
- In the event of a dispute between the Complainant and the Developer regarding the grievance, the option of appointing an independent mediator to assist with resolving the issue should be discussed. The record of the meeting/s must note that a dispute has arisen and that the grievance has not been resolved to the satisfaction of all the parties concerned.
- In the event that the parties agree to appoint a mediator, the Developer will be required to identify three (3) mediators and forward the names and CVs to the Complainant within 2 weeks of the dispute being declared. The Complainant, in consultation with the Developer, must identify the preferred mediator and agree on a date for the next meeting. The cost of the mediator must be borne by the Developer. The Developer must supply and nominate a representative to capture minutes and record the meeting/s.
- In the event of the grievance, with the assistance of the mediator, being resolved to the satisfaction of all the parties concerned, the outcome must be recorded and signed off by the relevant parties, including the mediator. The record should provide details on the date of the meeting/s, the names of

the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.

- In the event of the dispute not being resolved, the mediator must prepare a draft report that summaries the nature of the grievance and the dispute. The report should include a recommendation by the mediator on the proposed way forward with regard to the addressing the grievance.
- The draft report must be made available to the Complainant and the Developer for comment before being finalised and signed by all parties, which signature may not be unreasonably withheld by either party. Unless otherwise agreed, comments on the draft report must be forwarded to the company representative appointed to manage the grievance mechanism within 5 working days. The way forward will be informed by the recommendations of the mediator and the nature of the grievance.

A Complaint is closed out when no further action is required, or indeed possible. Closure status must be classified and captured following mediation or successful resolution in the Complaints Register as follows:

- Resolved. Complaints where a resolution has been agreed and implemented and the Complainant has signed the Confirmation Form.
- Unresolved. Complaints where it has not been possible to reach an agreed resolution despite mediation.
- Abandoned. Complaints where the Complainant is not contactable after one month following receipt of a Complaint and efforts to trace his or her whereabouts have been unsuccessful.

The grievance mechanism does not replace the right of an individual, community, group or organization to take legal action should they so wish. In the event of the grievance not being resolved to the satisfaction of Complainant and or the Developer, either party may be entitled to legal action if an appropriate option, however, this grievance mechanisms aims to avoid such interactions by addressing the grievances within a short timeframe, and to mutual satisfaction, where possible.

Appendix I:

Emergency preparedness, Response & Fire Management Plan

EMERGENCY PREPAREDNESS, RESPONSE AND FIRE MANAGEMENT PLAN

1. PURPOSE

The purpose of the Emergency Preparedness and Response Plan is:

- To assist contractor personnel to prepare for and respond quickly and safely to emergency incidents, and to establish a state of readiness which will enable prompt and effective responses to possible events.
- To control or limit any effect that an emergency or potential emergency may have on site or on neighbouring areas.
- To facilitate emergency responses and to provide such assistance on the site as is appropriate to the occasion.
- To ensure communication of all vital information as soon as possible.
- To facilitate the reorganisation and reconstruction activities so that normal operations can be resumed.
- To provide for training so that a high level of preparedness can be continually maintained.

This plan outlines response actions for potential incidents of any size. It details response procedures that will minimise potential health and safety hazards, environmental damage, and clean-up efforts. The plan has been prepared to ensure quick access to all the information required in responding to an emergency event. The plan will enable an effective, comprehensive response to prevent injury or damage to the construction personnel, public, and environment during the project. Contractors are expected to comply with all procedures described in this document. A Method Statement should be prepared at the commencement of construction detailing how this plan is to be implemented as well as details of relevant responsible parties for the implementation. The method statement must also reflect conditions of the IFC Performance Standard 1 and include the following:

- Identification of areas where accidents and emergency situations may occur;
- Communities and individuals that may be impacted;
- Response procedure;
- Provisions of equipment and resources;
- Designation of responsibilities;
- Communication; and
- Periodic training to ensure effective response to potentially affected communities.

2. PROJECT-SPECIFIC DETAILS

The project site is located adjacent to the town of Gouda and approximately 6km south of Saron in the Drakenstein Local Municipality, under the jurisdiction of the greater Cape Winelands District Municipality in the Western Cape. The proposed facility is to be known as the Bergriver Wind Farm.A project site considered to be suitable for the development of a wind farm, with an extent of approximately 1755 hectares, was identified by the project developer.

Due to the scale and nature of this development, it is anticipated that the following risks could potentially arises during the construction and operation phases:

» Fires;
» Leakage of hazardous substances;
» Storage of flammable materials and substances;
» Flood events;
» Accidents; and
» Natural disasters.

3. EMERGENCY RESPONSE PLAN

There are three levels of emergency as follows:

» Local Emergency: An alert confined to a specific locality.
» Site Emergency: An alert that cannot be localised and which presents danger to other areas within the site boundary or outside the site boundary.
» Evacuation: An alert when all personnel are required to leave the affected area and assemble in a safe location.

If there is any doubt as to whether any hazardous situation constitutes an emergency, then it must be treated as an Evacuation.

Every effort must be made to control, reduce or stop the cause of any emergency provided it is safe to do so. For example, in the event of a fire, isolate the fuel supply and limit the propagation of the fire by cooling the adjacent areas. Then confine and extinguish the fire (where appropriate) making sure that re-ignition cannot occur.

3.1. Emergency Scenario Contingency Planning

3.1.1. Scenario: Spill which would result in the contamination of land, surface or groundwater

i. Spill Prevention Measures

Preventing spills must be the top priority at all operations which have the potential of endangering the environment. The responsibility to effectively prevent and mitigate any scenario lies with the Contractor and the ECO. In order to reduce the risk of spills and associated contamination, the following principles should be considered during construction and operation activities:

» All equipment refuelling, servicing and maintenance activities should only be undertaken within appropriately sealed/contained or bunded designated areas.
» All maintenance materials, oils, grease, lubricants, etc. should be stored in a designated area in an appropriate storage container.
» No refuelling, storage, servicing, or maintenance of equipment should take place within sensitive environmental resources in order to reduce the risk of contamination by spills.
» No refuelling or servicing should be undertaken without absorbent material or drip pans properly placed to contain spilled fuel.
» Any fluids drained from the machinery during servicing should be collected in leak-proof containers and taken to an appropriate disposal or recycling facility.

- If these activities result in damage or accumulation of product on the soil, the contaminated soil must be disposed of as hazardous waste. Under no circumstances shall contaminated soil be added to a spoils pile and transported to a regular disposal site.
- Chemical toilets used during construction must be regularly cleaned. Chemicals used in toilets are also hazardous to the environment and must be controlled. Portable chemical toilets could overflow if not pumped regularly or they could spill if dropped or overturned during moving. Care and due diligence should be taken at all times.
- Contact details of emergency services and HazMat Response Contractors are to be clearly displayed on the site. All staff are to be made aware of these details and must be familiar with the procedures for notification in the event of an emergency.

ii. Procedures

The following action plan is proposed in the event of a spill:

1. Spill or release identified.
2. Assess person safety, safety of others and environment.
3. Stop the spill if safely possible.
4. Contain the spill to limit entering surrounding areas.
5. Identify the substance spilled.
6. Quantify the spill (under or over guideline/threshold levels).
7. Notify the Site Manager and emergency response crew and authorities (in the event of major spill).
8. Inform users (and downstream users) of the potential risk.
9. Clean up of the spill using spill kit or by HazMat team.
10. Record of the spill incident on company database.

a) Procedures for containing and controlling the spill (i.e. on land or in water)

Measures can be taken to prepare for quick and effective containment of any potential spills. Each contractor must keep sufficient supplies of spill containment equipment at the construction sites, at all times during and after the construction phase. These should include specialised spill kits or spill containment equipment. Other spill containment measures include using drip pans underneath vehicles and equipment every time refuelling, servicing, or maintenance activities are undertaken.

Specific spill containment methods for land and water contamination are outlined below.

Containment of Spills on Land

Spills on land include spills on rock, gravel, soil and/or vegetation. It is important to note that soil is a natural sorbent, and therefore spills on soil are generally less serious than spills on water as contaminated soil can be more easily recovered. It is important that all measures be undertaken to avoid spills reaching open water bodies. The following methods could be used:

- *Dykes* - Dykes can be created using soil surrounding a spill on land. These dykes are constructed around the perimeter or down slope of the spilled substance. A dyke needs to be built up to a size that will ensure containment of the maximum quantity of contaminant that may reach it. A plastic tarp can be placed on and at the base of the dyke such that the contaminant can pool up and subsequently

be removed with sorbent materials or by pump into barrels or bags. If the spill is migrating very slowly, a dyke may not be necessary and sorbents can be used to soak up contaminants before they migrate away from the source of the spill.

» *Trenches* - Trenches can be dug out to contain spills. Spades, pick axes or a front-end loader can be used depending on the size of the trench required. Spilled substances can then be recovered using a pump or sorbent materials.

b) Procedures for transferring, storing, and managing spill related wastes

Used sorbent materials are to be placed in plastic bags for future disposal. All materials mentioned in this section are to be available in the spill kits. Following clean up, any tools or equipment used must be properly washed and decontaminated, or replaced if this is not possible.

Spilled substances and materials used for containment must be placed into empty waste oil containers and sealed for proper disposal at an approved disposal facility.

c) Procedures for restoring affected areas

Criteria that may be considered include natural biodegradation of oil, replacement of soil and revegetation. Once a spill of reportable size has been contained, the ECO and the relevant Authority must be consulted to confirm that the appropriate clean up levels are met.

3.1.2. Scenario: Fire (and fire water handling)

i. Action Plan

The following action plan is proposed in the event of a fire:

1. Quantify risk.
2. Assess person safety, safety of others and environment.
3. If safe – attempt to extinguish the fire using appropriate equipment.
4. If not safe to extinguish, contain fire.
5. Notify Site Manager and emergency response crew and authorities.
6. Inform users of the potential risk of fire.
7. Record the incident on the company database or filing register.

ii. Procedures

Because large scale fires may spread very fast in the environment it is most advisable that the employee/contractor not put his/her life in danger in the case of an uncontrolled fire.

Portable firefighting equipment must be provided at strategic locations throughout the site, in line with the Building Code of South Africa and the relevant provincial building code. All emergency equipment including portable fire extinguisher, hose reels and hydrants must be maintained and inspected by a qualified contractor in accordance with the relevant legislation and national standards.

Current evacuation signs and diagrams for the building or site that are compliant to relevant state legislation must be provided in a conspicuous position, on each evacuation route. Contact details for the relevant emergency services should be clearly displayed on site and all employees should be aware of procedures to follow in the case of an emergency.

a) Procedures for initial actions

Persons should not fight the fire if any of the following conditions exist:

» They have not been trained or instructed in the use of a fire extinguisher.
» They do not know what is burning.
» The fire is spreading rapidly.
» They do not have the proper equipment.
» They cannot do so without a means of escape.
» They may inhale toxic smoke.

b) Reporting procedures

In terms of the requirements of NEMA, the responsible person must, within 14 days of the incident, report to the Director General, provincial head of department and municipality.

» Report fire immediately to the site manager, who will determine if it is to be reported to the relevant emergency services and authorities.
» The site manager must have copies of the Report form to be completed.

SUMMARY: RESPONSE PROCEDURE

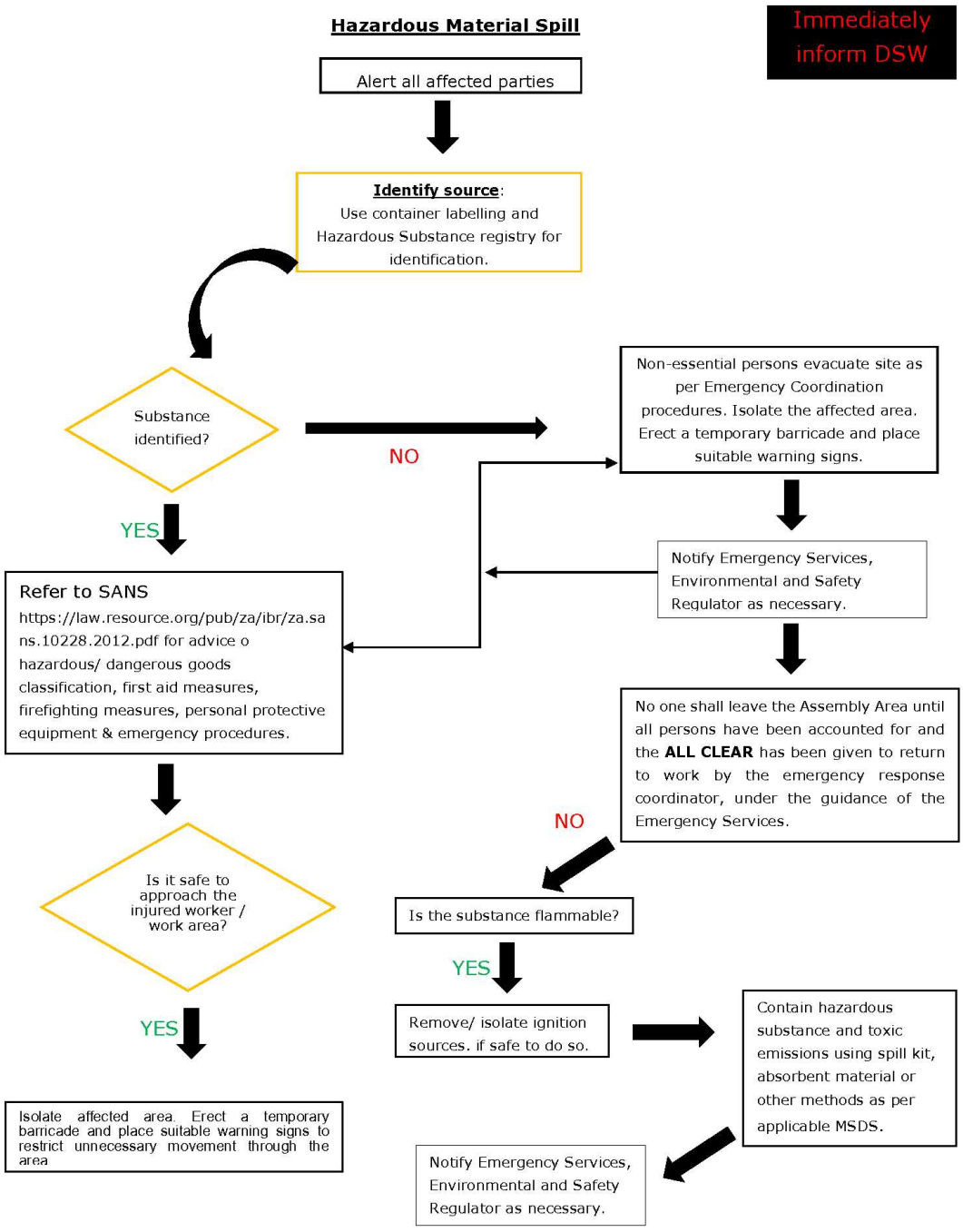


Figure 1: Hazardous Material Spill

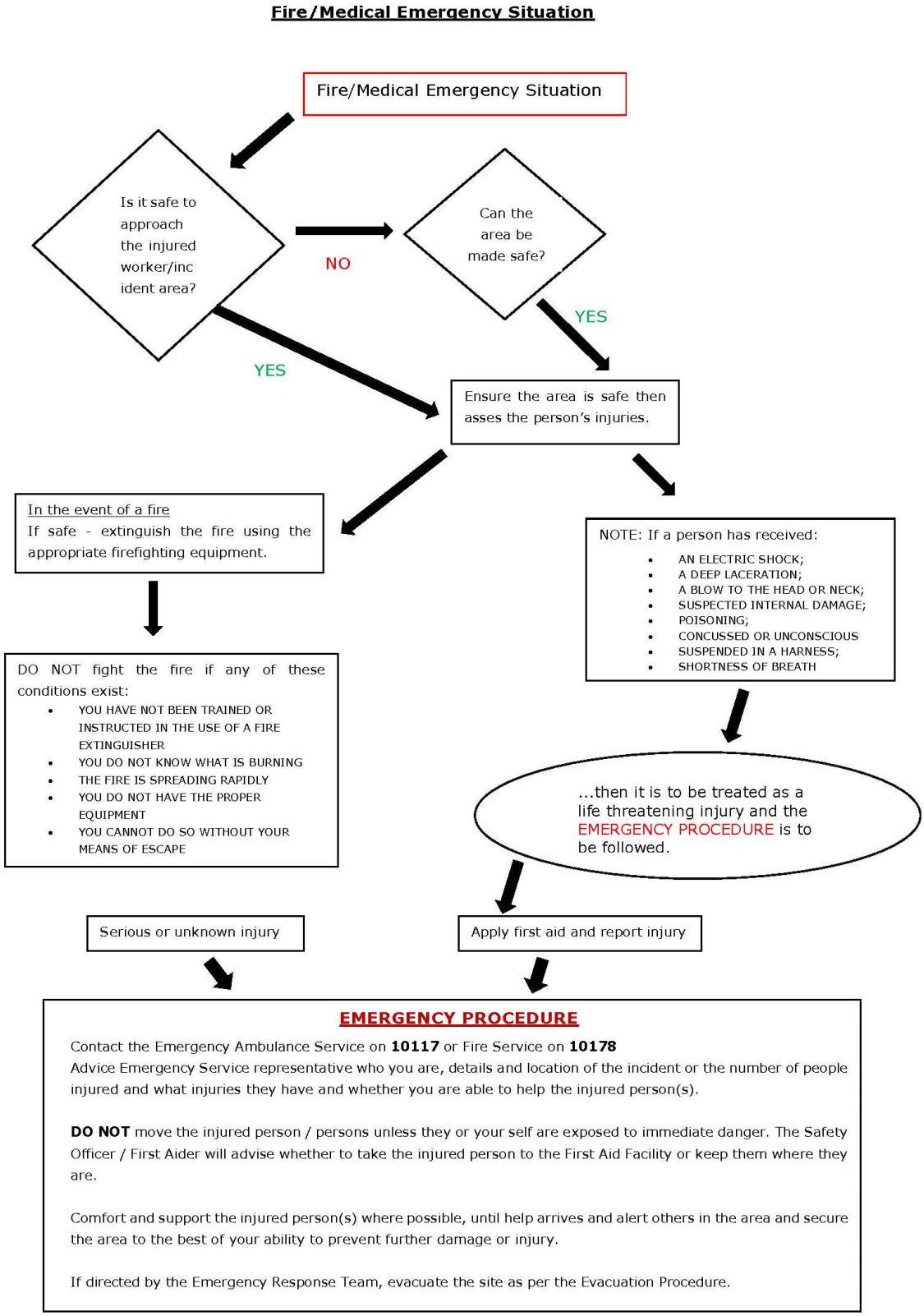


Figure 2: Emergency Fire/Medical

4. PROCEDURE RESPONSIBILITY

The Contractor's Safety, Health and Environment (SHE) Representative, employed by the Contractor, is responsible for managing the day-to-day on-site implementation of this EMPr, and for the compilation of regular (usually weekly) Monitoring Reports. In addition, the SHE must act as liaison and advisor on all environmental and related issues.

The local authorities will provide their assistance when deemed necessary, or when it has been requested and/or indicated in Section 30 (8) of NEMA. The provincial authority will provide assistance and guidance where required and conduct awareness programmes.