Appendix 1
IFC Handbook

Performance Standards on Environmental and Social Sustainability

January 1, 2012

Overview of Performance Standards on Environmental and Social Sustainability

1. IFC's Sustainability Framework articulates the Corporation's strategic commitment to sustainable development, and is an integral part of IFC's approach to risk management. The Sustainability Framework comprises IFC's Policy and Performance Standards on Environmental and Social Sustainability, and IFC's Access to Information Policy. The Policy on Environmental and Social Sustainability describes IFC's commitments, roles, and responsibilities related to environmental and social sustainability. IFC's Access to Information Policy reflects IFC's commitment to transparency and good governance on its operations, and outlines the Corporation's institutional disclosure obligations regarding its investment and advisory services. The Performance Standards are directed towards clients, providing guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client in relation to project-level activities. In the case of its direct investments (including project and corporate finance provided through financial intermediaries), IFC requires its clients to apply the Performance Standards to manage environmental and social risks and impacts so that development opportunities are enhanced. IFC uses the Sustainability Framework along with other strategies, policies, and initiatives to direct the business activities of the Corporation in order to achieve its overall development objectives. The Performance Standards may also be applied by other financial institutions.

2. Together, the eight Performance Standards establish standards that the client[1] is to meet throughout the life of an investment by IFC:

Performance Standard 1:	Assessment and Management of Environmental and Social Risks and Impacts
Performance Standard 2:	Labor and Working Conditions
Performance Standard 3:	Resource Efficiency and Pollution Prevention
Performance Standard 4:	Community Health, Safety, and Security
Performance Standard 5:	Land Acquisition and Involuntary Resettlement
Performance Standard 6:	Biodiversity Conservation and Sustainable Management of Living Natural Resources
Performance Standard 7:	Indigenous Peoples
Performance Standard 8:	Cultural Heritage

3. Performance Standard 1 establishes the importance of (i) integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects; (ii) effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and (iii) the client's management of environmental and social performance throughout the life of the project. Performance Standards 2 through 8 establish objectives and requirements to avoid, minimize, and where residual impacts remain, to compensate/offset for risks and impacts to workers, Affected Communities, and the environment. While all relevant environmental and social risks and potential impacts should be considered as part of the assessment, Performance Standards 2 through 8 describe potential environmental and social risks and impacts that require particular attention. Where environmental or social risks and impacts

[1] The term "client" is used throughout the Performance Standards broadly to refer to the party responsible for implementing and operating the project that is being financed, or the recipient of the financing, depending on the project structure and type of financing. The term "project" is defined in Performance Standard 1.

are identified, the client is required to manage them through its Environmental and Social Management System (ESMS) consistent with Performance Standard 1.

4. Performance Standard 1 applies to all projects that have environmental and social risks and impacts. Depending on project circumstances, other Performance Standards may apply as well. The Performance Standards should be read together and cross-referenced as needed. The requirements section of each Performance Standard applies to all activities financed under the project, unless otherwise noted in the specific limitations described in each paragraph. Clients are encouraged to apply the ESMS developed under Performance Standard 1 to all their project activities, regardless of financing source. A number of cross-cutting topics such as climate change, gender, human rights, and water, are addressed across multiple Performance Standards.

5. In addition to meeting the requirements under the Performance Standards, clients must comply with applicable national law, including those laws implementing host country obligations under international law.

6. The World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines) are technical reference documents with general and industry-specific examples of good international industry practice. IFC uses the EHS Guidelines as a technical source of information during project appraisal. The EHS Guidelines contain the performance levels and measures that are normally acceptable to IFC, and that are generally considered to be achievable in new facilities at reasonable costs by existing technology. For IFC-financed projects, application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets with an appropriate timetable for achieving them. The environmental assessment process may recommend alternative (higher or lower) levels or measures, which, if acceptable to IFC, become project- or site-specific requirements. The General EHS Guideline contains information on cross-cutting environmental, health, and safety issues potentially applicable to all industry sectors. It should be used together with the relevant industry sector guideline(s). The EHS Guidelines may be occasionally updated.

7. When host country regulations differ from the levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, a full and detailed justification for any proposed alternatives is needed as part of the site-specific environmental assessment. This justification should demonstrate that the choice for any alternative performance level is protective of human health and the environment.

8. A set of eight Guidance Notes, corresponding to each Performance Standard, and an additional Interpretation Note on Financial Intermediaries offer guidance on the requirements contained in the Performance Standards, including reference materials, and on good sustainability practices to help clients improve project performance. These Guidance/Interpretation Notes may be occasionally updated.

Performance Standard 1
Assessment and Management of Environmental and Social Risks and Impacts

January 1, 2012

Introduction

1. Performance Standard 1 underscores the importance of managing environmental and social performance throughout the life of a project. An effective Environmental and Social Management System (ESMS) is a dynamic and continuous process initiated and supported by management, and involves engagement between the client, its workers, local communities directly affected by the project (the Affected Communities) and, where appropriate, other stakeholders.[1] Drawing on the elements of the established business management process of "plan, do, check, and act," the ESMS entails a methodological approach to managing environmental and social risks[2] and impacts[3] in a structured way on an ongoing basis. A good ESMS appropriate to the nature and scale of the project promotes sound and sustainable environmental and social performance, and can lead to improved financial, social, and environmental outcomes.

2. At times, the assessment and management of certain environmental and social risks and impacts may be the responsibility of the government or other third parties over which the client does not have control or influence.[4] Examples of where this may happen include: (i) when early planning decisions are made by the government or third parties which affect the project site selection and/or design; and/or (ii) when specific actions directly related to the project are carried out by the government or third parties such as providing land for a project which may have previously involved the resettlement of communities or individuals and/or leading to loss of biodiversity. While the client cannot control these government or third party actions, an effective ESMS should identify the different entities involved and the roles they play, the corresponding risks they present to the client, and opportunities to collaborate with these third parties in order to help achieve environmental and social outcomes that are consistent with the Performance Standards. In addition, this Performance Standard supports the use of an effective grievance mechanism that can facilitate early indication of, and prompt remediation for those who believe that they have been harmed by a client's actions.

3. Business should respect human rights, which means to avoid infringing on the human rights of others and address adverse human rights impacts business may cause or contribute to. Each of the Performance Standards has elements related to human rights dimensions that a project may face in the course of its operations. Due diligence against these Performance Standards will enable the client to address many relevant human rights issues in its project.

Objectives

- To identify and evaluate environmental and social risks and impacts of the project.
- To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize,[5] and, where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment.

[1] Other stakeholders are those not directly affected by the project but that have an interest in it. These could include national and local authorities, neighboring projects, and/or nongovernmental organizations.

[2] Environmental and social risk is a combination of the probability of certain hazard occurrences and the severity of impacts resulting from such an occurrence.

[3] Environmental and social impacts refer to any change, potential or actual, to (i) the physical, natural, or cultural environment, and (ii) impacts on surrounding community and workers, resulting from the business activity to be supported.

[4] Contractors retained by, or acting on behalf of the client(s), are considered to be under direct control of the client and not considered third parties for the purposes of this Performance Standard.

[5] Acceptable options to minimize will vary and include: abate, rectify, repair, and/or restore impacts, as appropriate. The risk and impact mitigation hierarchy is further discussed and specified in the context of Performance Standards 2 through 8, where relevant.

- To promote improved environmental and social performance of clients through the effective use of management systems.
- To ensure that grievances from Affected Communities and external communications from other stakeholders are responded to and managed appropriately.
- To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.

Scope of Application

4. This Performance Standard applies to business activities with environmental and/or social risks and/or impacts. For the purposes of this Performance Standard, the term "project" refers to a defined set of business activities, including those where specific physical elements, aspects, and facilities likely to generate risks and impacts, have yet to be identified.[6] Where applicable, this could include aspects from the early developmental stages through the entire life cycle (design, construction, commissioning, operation, decommissioning, closure or, where applicable, post-closure) of a physical asset.[7] The requirements of this Performance Standard apply to all business activities unless otherwise noted in the specific limitations described in each of the paragraphs below.

Requirements

Environmental and Social Assessment and Management System

5. The client, in coordination with other responsible government agencies and third parties as appropriate,[8] will conduct a process of environmental and social assessment, and establish and maintain an ESMS appropriate to the nature and scale of the project and commensurate with the level of its environmental and social risks and impacts. The ESMS will incorporate the following elements: (i) policy; (ii) identification of risks and impacts; (iii) management programs; (iv) organizational capacity and competency; (v) emergency preparedness and response; (vi) stakeholder engagement; and (vii) monitoring and review.

Policy

6. The client will establish an overarching policy defining the environmental and social objectives and principles that guide the project to achieve sound environmental and social performance.[9] The policy provides a framework for the environmental and social assessment and management process, and specifies that the project (or business activities, as appropriate) will comply with the applicable laws and regulations of the jurisdictions in which it is being undertaken, including those laws implementing host country obligations under international law. The policy should be consistent with the principles of the Performance Standards. Under some circumstances, clients may also subscribe

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[6] For example, corporate entities which have portfolios of existing physical assets, and/or intend to develop or acquire new facilities, and investment funds or financial intermediaries with existing portfolios of assets and/or which intend to invest in new facilities.

[7] Recognizing that this Performance Standard is used by a variety of financial institutions, investors, insurers, and owner/operators, each user should separately specify the business activities to which this Performance Standard should apply.

[8] That is, those parties legally obligated and responsible for assessing and managing specific risks and impacts (e.g., government-led resettlement).

[9] This requirement is a stand-alone, project-specific policy and is not intended to affect (or require alteration of) existing policies the client may have defined for non-related projects, business activities, or higher-level corporate activities.

to other internationally recognized standards, certification schemes, or codes of practice and these too should be included in the policy. The policy will indicate who, within the client's organization, will ensure conformance with the policy and be responsible for its execution (with reference to an appropriate responsible government agency or third party, as necessary). The client will communicate the policy to all levels of its organization.

Identification of Risks and Impacts

7. The client will establish and maintain a process for identifying the environmental and social risks and impacts of the project (see paragraph 18 for competency requirements). The type, scale, and location of the project guide the scope and level of effort devoted to the risks and impacts identification process. The scope of the risks and impacts identification process will be consistent with good international industry practice,[10] and will determine the appropriate and relevant methods and assessment tools. The process may comprise a full-scale environmental and social impact assessment, a limited or focused environmental and social assessment, or straightforward application of environmental siting, pollution standards, design criteria, or construction standards.[11] When the project involves existing assets, environmental and/or social audits or risk/hazard assessments can be appropriate and sufficient to identify risks and impacts. If assets to be developed, acquired or financed have yet to be defined, the establishment of an environmental and social due diligence process will identify risks and impacts at a point in the future when the physical elements, assets, and facilities are reasonably understood. The risks and impacts identification process will be based on recent environmental and social baseline data at an appropriate level of detail. The process will consider all relevant environmental and social risks and impacts of the project, including the issues identified in Performance Standards 2 through 8, and those who are likely to be affected by such risks and impacts.[12] The risks and impacts identification process will consider the emissions of greenhouse gases, the relevant risks associated with a changing climate and the adaptation opportunities, and potential transboundary effects, such as pollution of air, or use or pollution of international waterways.

8. Where the project involves specifically identified physical elements, aspects, and facilities that are likely to generate impacts, environmental and social risks and impacts will be identified in the context of the project's area of influence. This area of influence encompasses, as appropriate:

- The area likely to be affected by: (i) the project[13] and the client's activities and facilities that are directly owned, operated or managed (including by contractors) and that are a component of the project;[14] (ii) impacts from unplanned but predictable developments caused by the project that may occur later or at a different location; or (iii) indirect project impacts on biodiversity or on ecosystem services upon which Affected Communities' livelihoods are dependent.

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[10] Defined as the exercise of professional skill, diligence, prudence, and foresight that would reasonably be expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances globally or regionally.

[11] For greenfield developments or large expansions with specifically indentified physical elements, aspects, and facilities that are likely to generate potential significant environmental or social impacts, the client will conduct a comprehensive Environmental and Social Impact Assessment, including an examination of alternatives, where appropriate.

[12] In limited high risk circumstances, it may be appropriate for the client to complement its environmental and social risks and impacts identification process with specific human rights due diligence as relevant to the particular business.

[13] Examples include the project's sites, the immediate airshed and watershed, or transport corridors.

[14] Examples include power transmission corridors, pipelines, canals, tunnels, relocation and access roads, borrow and disposal areas, construction camps, and contaminated land (e.g., soil, groundwater, surface water, and sediments).

- Associated facilities, which are facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable.[15]
- Cumulative impacts[16] that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.

9. In the event of risks and impacts in the project's area of influence resulting from a third party's actions, the client will address those risks and impacts in a manner commensurate with the client's control and influence over the third parties, and with due regard to conflict of interest.

10. Where the client can reasonably exercise control, the risks and impacts identification process will also consider those risks and impacts associated with primary supply chains, as defined in Performance Standard 2 (paragraphs 27–29) and Performance Standard 6 (paragraph 30).

11. Where the project involves specifically identified physical elements, aspects and facilities that are likely to generate environmental and social impacts, the identification of risks and impacts will take into account the findings and conclusions of related and applicable plans, studies, or assessments prepared by relevant government authorities or other parties that are directly related to the project and its area of influence.[17] These include master economic development plans, country or regional plans, feasibility studies, alternatives analyses, and cumulative, regional, sectoral, or strategic environmental assessments where relevant. The risks and impacts identification will take account of the outcome of the engagement process with Affected Communities as appropriate.

12. Where the project involves specifically identified physical elements, aspects and facilities that are likely to generate impacts, and as part of the process of identifying risks and impacts, the client will identify individuals and groups that may be directly and differentially or disproportionately affected by the project because of their disadvantaged or vulnerable status.[18] Where individuals or groups are identified as disadvantaged or vulnerable, the client will propose and implement differentiated measures so that adverse impacts do not fall disproportionately on them and they are not disadvantaged in sharing development benefits and opportunities.

Management Programs

13. Consistent with the client's policy and the objectives and principles described therein, the client will establish management programs that, in sum, will describe mitigation and performance improvement measures and actions that address the identified environmental and social risks and impacts of the project.

[15] Associated facilities may include railways, roads, captive power plants or transmission lines, pipelines, utilities, warehouses, and logistics terminals.

[16] Cumulative impacts are limited to those impacts generally recognized as important on the basis of scientific concerns and/or concerns from Affected Communities. Examples of cumulative impacts include: incremental contribution of gaseous emissions to an airshed; reduction of water flows in a watershed due to multiple withdrawals; increases in sediment loads to a watershed; interference with migratory routes or wildlife movement; or more traffic congestion and accidents due to increases in vehicular traffic on community roadways.

[17] The client can take these into account by focusing on the project's incremental contribution to selected impacts generally recognized as important on the basis of scientific concern or concerns from the Affected Communities within the area addressed by these larger scope regional studies or cumulative assessments.

[18] This disadvantaged or vulnerable status may stem from an individual's or group's race, color, sex, language, religion, political or other opinion, national or social origin, property, birth, or other status. The client should also consider factors such as gender, age, ethnicity, culture, literacy, sickness, physical or mental disability, poverty or economic disadvantage, and dependence on unique natural resources.

14. Depending on the nature and scale of the project, these programs may consist of some documented combination of operational procedures, practices, plans, and related supporting documents (including legal agreements) that are managed in a systematic way.[19] The programs may apply broadly across the client's organization, including contractors and primary suppliers over which the organization has control or influence, or to specific sites, facilities, or activities. The mitigation hierarchy to address identified risks and impacts will favor the avoidance of impacts over minimization, and, where residual impacts remain, compensation/offset, wherever technically[20] and financially feasible.[21]

15. Where the identified risks and impacts cannot be avoided, the client will identify mitigation and performance measures and establish corresponding actions to ensure the project will operate in compliance with applicable laws and regulations, and meet the requirements of Performance Standards 1 through 8. The level of detail and complexity of this collective management program and the priority of the identified measures and actions will be commensurate with the project's risks and impacts, and will take account of the outcome of the engagement process with Affected Communities as appropriate.

16. The management programs will establish environmental and social Action Plans,[22] which will define desired outcomes and actions to address the issues raised in the risks and impacts identification process, as measurable events to the extent possible, with elements such as performance indicators, targets, or acceptance criteria that can be tracked over defined time periods, and with estimates of the resources and responsibilities for implementation. As appropriate, the management program will recognize and incorporate the role of relevant actions and events controlled by third parties to address identified risks and impacts. Recognizing the dynamic nature of the project, the management program will be responsive to changes in circumstances, unforeseen events, and the results of monitoring and review.

Organizational Capacity and Competency

17. The client, in collaboration with appropriate and relevant third parties, will establish, maintain, and strengthen as necessary an organizational structure that defines roles, responsibilities, and authority to implement the ESMS. Specific personnel, including management representative(s), with clear lines of responsibility and authority should be designated. Key environmental and social responsibilities should be well defined and communicated to the relevant personnel and to the rest of the client's organization. Sufficient management sponsorship and human and financial resources will be provided on an ongoing basis to achieve effective and continuous environmental and social performance.

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[19] Existing legal agreements between the client and third parties that address mitigation actions with regard to specific impacts constitute part of a program. Examples are government-managed resettlement responsibilities specified in an agreement.

[20] Technical feasibility is based on whether the proposed measures and actions can be implemented with commercially available skills, equipment, and materials, taking into consideration prevailing local factors such as climate, geography, demography, infrastructure, security, governance, capacity, and operational reliability.

[21] Financial feasibility is based on commercial considerations, including relative magnitude of the incremental cost of adopting such measures and actions compared to the project's investment, operating, and maintenance costs, and on whether this incremental cost could make the project nonviable to the client.

[22] Action plans may include an overall Environmental and Social Action Plan necessary for carrying out a suite of mitigation measures or thematic action plans, such as Resettlement Action Plans or Biodiversity Action Plans. Action plans may be plans designed to fill in the gaps of existing management programs to ensure consistency with the Performance Standards, or they may be stand alone plans that specify the project's mitigation strategy. The "Action plan" terminology is understood by some communities of practice to mean Management plans, or Development plans. In this case, examples are numerous and include various types of environmental and social management plans.

18. Personnel within the client's organization with direct responsibility for the project's environmental and social performance will have the knowledge, skills, and experience necessary to perform their work, including current knowledge of the host country's regulatory requirements and the applicable requirements of Performance Standards 1 through 8. Personnel will also possess the knowledge, skills, and experience to implement the specific measures and actions required under the ESMS and the methods required to perform the actions in a competent and efficient manner.

19. The process of identification of risks and impacts will consist of an adequate, accurate, and objective evaluation and presentation, prepared by competent professionals. For projects posing potentially significant adverse impacts or where technically complex issues are involved, clients may be required to involve external experts to assist in the risks and impacts identification process.

Emergency Preparedness and Response

20. Where the project involves specifically identified physical elements, aspects and facilities that are likely to generate impacts, the ESMS will establish and maintain an emergency preparedness and response system so that the client, in collaboration with appropriate and relevant third parties, will be prepared to respond to accidental and emergency situations associated with the project in a manner appropriate to prevent and mitigate any harm to people and/or the environment. This preparation will include the identification of areas where accidents and emergency situations may occur, communities and individuals that may be impacted, response procedures, provision of equipment and resources, designation of responsibilities, communication, including that with potentially Affected Communities and periodic training to ensure effective response. The emergency preparedness and response activities will be periodically reviewed and revised, as necessary, to reflect changing conditions.

21. Where applicable, the client will also assist and collaborate with the potentially Affected Communities (see Performance Standard 4) and the local government agencies in their preparations to respond effectively to emergency situations, especially when their participation and collaboration are necessary to ensure effective response. If local government agencies have little or no capacity to respond effectively, the client will play an active role in preparing for and responding to emergencies associated with the project. The client will document its emergency preparedness and response activities, resources, and responsibilities, and will provide appropriate information to potentially Affected Community and relevant government agencies.

Monitoring and Review

22. The client will establish procedures to monitor and measure the effectiveness of the management program, as well as compliance with any related legal and/or contractual obligations and regulatory requirements. Where the government or other third party has responsibility for managing specific risks and impacts and associated mitigation measures, the client will collaborate in establishing and monitoring such mitigation measures. Where appropriate, clients will consider involving representatives from Affected Communities to participate in monitoring activities.[23] The client's monitoring program should be overseen by the appropriate level in the organization. For projects with significant impacts, the client will retain external experts to verify its monitoring information. The extent of monitoring should be commensurate with the project's environmental and social risks and impacts and with compliance requirements.

23. In addition to recording information to track performance and establishing relevant operational controls, the client should use dynamic mechanisms, such as internal inspections and audits, where relevant, to verify compliance and progress toward the desired outcomes. Monitoring will normally

[23] For example, participatory water monitoring.

include recording information to track performance and comparing this against the previously established benchmarks or requirements in the management program. Monitoring should be adjusted according to performance experience and actions requested by relevant regulatory authorities. The client will document monitoring results and identify and reflect the necessary corrective and preventive actions in the amended management program and plans. The client, in collaboration with appropriate and relevant third parties, will implement these corrective and preventive actions, and follow up on these actions in upcoming monitoring cycles to ensure their effectiveness.

24. Senior management in the client organization will receive periodic performance reviews of the effectiveness of the ESMS, based on systematic data collection and analysis. The scope and frequency of such reporting will depend upon the nature and scope of the activities identified and undertaken in accordance with the client's ESMS and other applicable project requirements. Based on results within these performance reviews, senior management will take the necessary and appropriate steps to ensure the intent of the client's policy is met, that procedures, practices, and plans are being implemented, and are seen to be effective.

Stakeholder Engagement

25. Stakeholder engagement is the basis for building strong, constructive, and responsive relationships that are essential for the successful management of a project's environmental and social impacts.[24] Stakeholder engagement is an ongoing process that may involve, in varying degrees, the following elements: stakeholder analysis and planning, disclosure and dissemination of information, consultation and participation, grievance mechanism, and ongoing reporting to Affected Communities. The nature, frequency, and level of effort of stakeholder engagement may vary considerably and will be commensurate with the project's risks and adverse impacts, and the project's phase of development.

Stakeholder Analysis and Engagement Planning

26. Clients should identify the range of stakeholders that may be interested in their actions and consider how external communications might facilitate a dialog with all stakeholders (paragraph 34 below). Where projects involve specifically identified physical elements, aspects and/or facilities that are likely to generate adverse environmental and social impacts to Affected Communities the client will identify the Affected Communities and will meet the relevant requirements described below.

27. The client will develop and implement a Stakeholder Engagement Plan that is scaled to the project risks and impacts and development stage, and be tailored to the characteristics and interests of the Affected Communities. Where applicable, the Stakeholder Engagement Plan will include differentiated measures to allow the effective participation of those identified as disadvantaged or vulnerable. When the stakeholder engagement process depends substantially on community representatives,[25] the client will make every reasonable effort to verify that such persons do in fact represent the views of Affected Communities and that they can be relied upon to faithfully communicate the results of consultations to their constituents.

28. In cases where the exact location of the project is not known, but it is reasonably expected to have significant impacts on local communities, the client will prepare a Stakeholder Engagement Framework, as part of its management program, outlining general principles and a strategy to identify Affected Communities and other relevant stakeholders and plan for an engagement process

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[24] Requirements regarding engagement of workers and related grievance redress procedures are found in Performance Standard 2.

[25] For example, community and religious leaders, local government representatives, civil society representatives, politicians, school teachers, and/or others representing one or more affected stakeholder groups.

compatible with this Performance Standard that will be implemented once the physical location of the project is known.

Disclosure of Information

29. Disclosure of relevant project information helps Affected Communities and other stakeholders understand the risks, impacts and opportunities of the project. The client will provide Affected Communities with access to relevant information[26] on: (i) the purpose, nature, and scale of the project; (ii) the duration of proposed project activities; (iii) any risks to and potential impacts on such communities and relevant mitigation measures; (iv) the envisaged stakeholder engagement process; and (v) the grievance mechanism.

Consultation

30. When Affected Communities are subject to identified risks and adverse impacts from a project, the client will undertake a process of consultation in a manner that provides the Affected Communities with opportunities to express their views on project risks, impacts and mitigation measures, and allows the client to consider and respond to them. The extent and degree of engagement required by the consultation process should be commensurate with the project's risks and adverse impacts and with the concerns raised by the Affected Communities. Effective consultation is a two-way process that should: (i) begin early in the process of identification of environmental and social risks and impacts and continue on an ongoing basis as risks and impacts arise; (ii) be based on the prior disclosure and dissemination of relevant, transparent, objective, meaningful and easily accessible information which is in a culturally appropriate local language(s) and format and is understandable to Affected Communities; (iii) focus inclusive[27] engagement on those directly affected as opposed to those not directly affected; (iv) be free of external manipulation, interference, coercion, or intimidation; (v) enable meaningful participation, where applicable; and (vi) be documented. The client will tailor its consultation process to the language preferences of the Affected Communities, their decision-making process, and the needs of disadvantaged or vulnerable groups. If clients have already engaged in such a process, they will provide adequate documented evidence of such engagement.

Informed Consultation and Participation

31. For projects with potentially significant adverse impacts on Affected Communities, the client will conduct an Informed Consultation and Participation (ICP) process that will build upon the steps outlined above in Consultation and will result in the Affected Communities' informed participation. ICP involves a more in-depth exchange of views and information, and an organized and iterative consultation, leading to the client's incorporating into their decision-making process the views of the Affected Communities on matters that affect them directly, such as the proposed mitigation measures, the sharing of development benefits and opportunities, and implementation issues. The consultation process should (i) capture both men's and women's views, if necessary through separate forums or engagements, and (ii) reflect men's and women's different concerns and priorities about impacts, mitigation mechanisms, and benefits, where appropriate. The client will document the process, in particular the measures taken to avoid or minimize risks to and adverse impacts on the

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[26] Depending on the scale of the project and significance of the risks and impacts, relevant document(s) could range from full Environmental and Social Assessments and Action Plans (i.e., Stakeholder Engagement Plan, Resettlement Action Plans, Biodiversity Action Plans, Hazardous Materials Management Plans, Emergency Preparedness and Response Plans, Community Health and Safety Plans, Ecosystem Restoration Plans, and Indigenous Peoples Development Plans, etc.) to easy-to-understand summaries of key issues and commitments. These documents could also include the client's environmental and social policy and any supplemental measures and actions defined as a result of independent due diligence conducted by financiers.

[27] Such as men, women, the elderly, youth, displaced persons, and vulnerable and disadvantaged persons or groups.

Affected Communities, and will inform those affected about how their concerns have been considered.

Indigenous Peoples
32. For projects with adverse impacts to Indigenous Peoples, the client is required to engage them in a process of ICP and in certain circumstances the client is required to obtain their Free, Prior, and Informed Consent (FPIC). The requirements related to Indigenous Peoples and the definition of the special circumstances requiring FPIC are described in Performance Standard 7.

Private Sector Responsibilities Under Government-Led Stakeholder Engagement
33. Where stakeholder engagement is the responsibility of the host government, the client will collaborate with the responsible government agency, to the extent permitted by the agency, to achieve outcomes that are consistent with the objectives of this Performance Standard. In addition, where government capacity is limited, the client will play an active role during the stakeholder engagement planning, implementation, and monitoring. If the process conducted by the government does not meet the relevant requirements of this Performance Standard, the client will conduct a complementary process and, where appropriate, identify supplemental actions.

External Communications and Grievance Mechanisms

External Communications
34. Clients will implement and maintain a procedure for external communications that includes methods to (i) receive and register external communications from the public; (ii) screen and assess the issues raised and determine how to address them; (iii) provide, track, and document responses, if any; and (iv) adjust the management program, as appropriate. In addition, clients are encouraged to make publicly available periodic reports on their environmental and social sustainability.

Grievance Mechanism for Affected Communities
35. Where there are Affected Communities, the client will establish a grievance mechanism to receive and facilitate resolution of Affected Communities' concerns and grievances about the client's environmental and social performance. The grievance mechanism should be scaled to the risks and adverse impacts of the project and have Affected Communities as its primary user. It should seek to resolve concerns promptly, using an understandable and transparent consultative process that is culturally appropriate and readily accessible, and at no cost and without retribution to the party that originated the issue or concern. The mechanism should not impede access to judicial or administrative remedies. The client will inform the Affected Communities about the mechanism in the course of the stakeholder engagement process.

Ongoing Reporting to Affected Communities

36. The client will provide periodic reports to the Affected Communities that describe progress with implementation of the project Action Plans on issues that involve ongoing risk to or impacts on Affected Communities and on issues that the consultation process or grievance mechanism have identified as a concern to those Communities. If the management program results in material changes in or additions to the mitigation measures or actions described in the Action Plans on issues of concern to the Affected Communities, the updated relevant mitigation measures or actions will be communicated to them. The frequency of these reports will be proportionate to the concerns of Affected Communities but not less than annually.

Performance Standard 2
Labor and Working Conditions

January 1, 2012

Introduction

1. Performance Standard 2 recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental[1] rights of workers. For any business, the workforce is a valuable asset, and a sound worker-management relationship is a key ingredient in the sustainability of a company. Failure to establish and foster a sound worker-management relationship can undermine worker commitment and retention, and can jeopardize a project. Conversely, through a constructive worker-management relationship, and by treating the workers fairly and providing them with safe and healthy working conditions, clients may create tangible benefits, such as enhancement of the efficiency and productivity of their operations.

2. The requirements set out in this Performance Standard have been in part guided by a number of international conventions and instruments, including those of the International Labour Organization (ILO) and the United Nations (UN).[2]

Objectives

- To promote the fair treatment, non-discrimination, and equal opportunity of workers.
- To establish, maintain, and improve the worker-management relationship.
- To promote compliance with national employment and labor laws.
- To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain.
- To promote safe and healthy working conditions, and the health of workers.
- To avoid the use of forced labor.

Scope of Application

3. The applicability of this Performance Standard is established during the environmental and social risks and impacts identification process. The implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the client's Environmental and Social Management System (ESMS), the elements of which are outlined in Performance Standard 1.

4. The scope of application of this Performance Standard depends on the type of employment relationship between the client and the worker. It applies to workers directly engaged by the client (direct workers), workers engaged through third parties to perform work related to core business

[1] As guided by the ILO Conventions listed in footnote 2.

[2] These conventions are:
ILO Convention 87 on Freedom of Association and Protection of the Right to Organize
ILO Convention 98 on the Right to Organize and Collective Bargaining
ILO Convention 29 on Forced Labor
ILO Convention 105 on the Abolition of Forced Labor
ILO Convention 138 on Minimum Age (of Employment)
ILO Convention 182 on the Worst Forms of Child Labor
ILO Convention 100 on Equal Remuneration
ILO Convention 111 on Discrimination (Employment and Occupation)
UN Convention on the Rights of the Child, Article 32.1
UN Convention on the Protection of the Rights of all Migrant Workers and Members of their Families

processes[3] of the project for a substantial duration (contracted workers), as well as workers engaged by the client's primary suppliers (supply chain workers).[4]

Direct Workers

5. With respect to direct workers, the client will apply the requirements of paragraphs 8–23 of this Performance Standard.

Contracted Workers

6. With respect to contracted workers, the client will apply the requirements of paragraphs 23–26 of this Performance Standard.

Supply Chain Workers

7. With respect to supply chain workers, the client will apply the requirements of paragraphs 27–29 of this Performance Standard.

Requirements

Working Conditions and Management of Worker Relationship

Human Resources Policies and Procedures

8. The client will adopt and implement human resources policies and procedures appropriate to its size and workforce that set out its approach to managing workers consistent with the requirements of this Performance Standard and national law.

9. The client will provide workers with documented information that is clear and understandable, regarding their rights under national labor and employment law and any applicable collective agreements, including their rights related to hours of work, wages, overtime, compensation, and benefits upon beginning the working relationship and when any material changes occur.

Working Conditions and Terms of Employment

10. Where the client is a party to a collective bargaining agreement with a workers' organization, such agreement will be respected. Where such agreements do not exist, or do not address working conditions and terms of employment,[5] the client will provide reasonable working conditions and terms of employment.[6]

11. The client will identify migrant workers and ensure that they are engaged on substantially equivalent terms and conditions to non-migrant workers carrying out similar work.

[3] Core business processes constitute those production and/or service processes essential for a specific business activity without which the business activity could not continue.

[4] Primary suppliers are those suppliers who, on an ongoing basis, provide goods or materials essential for the core business processes of the project.

[5] Working conditions and terms of employment examples are wages and benefits; wage deductions; hours of work; overtime arrangements and overtime compensation; breaks; rest days; and leave for illness, maternity, vacation or holiday.

[6] Reasonable working conditions and terms of employment could be assessed by reference to (i) conditions established for work of the same character in the trade or industry concerned in the area/region where the work is carried out; (ii) collective agreement or other recognized negotiation between other organizations of employers and workers' representatives in the trade or industry concerned; (iii) arbitration award; or (iv) conditions established by national law.

12. Where accommodation services[7] are provided to workers covered by the scope of this Performance Standard, the client will put in place and implement policies on the quality and management of the accommodation and provision of basic services.[8] The accommodation services will be provided in a manner consistent with the principles of non-discrimination and equal opportunity. Workers' accommodation arrangements should not restrict workers' freedom of movement or of association.

Workers' Organizations

13. In countries where national law recognizes workers' rights to form and to join workers' organizations of their choosing without interference and to bargain collectively, the client will comply with national law. Where national law substantially restricts workers' organizations, the client will not restrict workers from developing alternative mechanisms to express their grievances and protect their rights regarding working conditions and terms of employment. The client should not seek to influence or control these mechanisms

14. In either case described in paragraph 13 of this Performance Standard, and where national law is silent, the client will not discourage workers from electing worker representatives, forming or joining workers' organizations of their choosing, or from bargaining collectively, and will not discriminate or retaliate against workers who participate, or seek to participate, in such organizations and collective bargaining. The client will engage with such workers' representatives and workers' organizations, and provide them with information needed for meaningful negotiation in a timely manner. Workers' organizations are expected to fairly represent the workers in the workforce.

Non-Discrimination and Equal Opportunity

15. The client will not make employment decisions on the basis of personal characteristics[9] unrelated to inherent job requirements. The client will base the employment relationship on the principle of equal opportunity and fair treatment, and will not discriminate with respect to any aspects of the employment relationship, such as recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, job assignment, promotion, termination of employment or retirement, and disciplinary practices. The client will take measures to prevent and address harassment, intimidation, and/or exploitation, especially in regard to women. The principles of non-discrimination apply to migrant workers.

16. In countries where national law provides for non-discrimination in employment, the client will comply with national law. When national laws are silent on non-discrimination in employment, the client will meet this Performance Standard. In circumstances where national law is inconsistent with this Performance Standard, the client is encouraged to carry out its operations consistent with the intent of paragraph 15 above without contravening applicable laws.

17. Special measures of protection or assistance to remedy past discrimination or selection for a particular job based on the inherent requirements of the job will not be deemed as discrimination, provided they are consistent with national law.

[7] Those services might be provided either directly by the client or by third parties.

[8] Basic services requirements refer to minimum space, supply of water, adequate sewage and garbage disposal system, appropriate protection against heat, cold, damp, noise, fire and disease-carrying animals, adequate sanitary and washing facilities, ventilation, cooking and storage facilities and natural and artificial lighting, and in some cases basic medical services.

[9] Such as gender, race, nationality, ethnic, social and indigenous origin, religion or belief, disability, age, or sexual orientation.

Retrenchment

18. Prior to implementing any collective dismissals,[10] the client will carry out an analysis of alternatives to retrenchment.[11] If the analysis does not identify viable alternatives to retrenchment, a retrenchment plan will be developed and implemented to reduce the adverse impacts of retrenchment on workers. The retrenchment plan will be based on the principle of non-discrimination and will reflect the client's consultation with workers, their organizations, and, where appropriate, the government, and comply with collective bargaining agreements if they exist. The client will comply with all legal and contractual requirements related to notification of public authorities, and provision of information to, and consultation with workers and their organizations.

19. The client should ensure that all workers receive notice of dismissal and severance payments mandated by law and collective agreements in a timely manner. All outstanding back pay and social security benefits and pension contributions and benefits will be paid (i) on or before termination of the working relationship to the workers, (ii) where appropriate, for the benefit of the workers, or (iii) payment will be made in accordance with a timeline agreed through a collective agreement. Where payments are made for the benefit of workers, workers will be provided with evidence of such payments.

Grievance Mechanism

20. The client will provide a grievance mechanism for workers (and their organizations, where they exist) to raise workplace concerns. The client will inform the workers of the grievance mechanism at the time of recruitment and make it easily accessible to them. The mechanism should involve an appropriate level of management and address concerns promptly, using an understandable and transparent process that provides timely feedback to those concerned, without any retribution. The mechanism should also allow for anonymous complaints to be raised and addressed. The mechanism should not impede access to other judicial or administrative remedies that might be available under the law or through existing arbitration procedures, or substitute for grievance mechanisms provided through collective agreements.

Protecting the Work Force

Child Labor

21. The client will not employ children in any manner that is economically exploitative, or is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development. The client will identify the presence of all persons under the age of 18. Where national laws have provisions for the employment of minors, the client will follow those laws applicable to the client. Children under the age of 18 will not be employed in hazardous work.[12] All work of persons under the age of 18 will be subject to an appropriate risk assessment and regular monitoring of health, working conditions, and hours of work.

[10] Collective dismissals cover all multiple dismissals that are a result of an economic, technical, or organizational reason; or other reasons that are not related to performance or other personal reasons.

[11] Examples of alternatives may include negotiated working-time reduction programs, employee capacity-building programs; long-term maintenance works during low production periods, etc.

[12] Examples of hazardous work activities include work (i) with exposure to physical, psychological, or sexual abuse; (ii) underground, underwater, working at heights, or in confined spaces; (iii) with dangerous machinery, equipment, or tools, or involving handling of heavy loads; (iv) in unhealthy environments exposing the worker to hazardous substances, agents, processes, temperatures, noise, or vibration damaging to health; or (v) under difficult conditions such as long hours, late night, or confinement by employer.

Forced Labor

22. The client will not employ forced labor, which consists of any work or service not voluntarily performed that is exacted from an individual under threat of force or penalty. This covers any kind of involuntary or compulsory labor, such as indentured labor, bonded labor, or similar labor-contracting arrangements. The client will not employ trafficked persons.[13]

Occupational Health and Safety

23. The client will provide a safe and healthy work environment, taking into account inherent risks in its particular sector and specific classes of hazards in the client's work areas, including physical, chemical, biological, and radiological hazards, and specific threats to women. The client will take steps to prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work by minimizing, as far as reasonably practicable, the causes of hazards. In a manner consistent with good international industry practice,[14] as reflected in various internationally recognized sources including the World Bank Group Environmental, Health and Safety Guidelines, the client will address areas that include the (i) identification of potential hazards to workers, particularly those that may be life-threatening; (ii) provision of preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; (iii) training of workers; (iv) documentation and reporting of occupational accidents, diseases, and incidents; and (v) emergency prevention, preparedness, and response arrangements. For additional information related to emergency preparedness and response refer to Performance Standard 1.

Workers Engaged by Third Parties

24. With respect to contracted workers the client will take commercially reasonable efforts to ascertain that the third parties who engage these workers are reputable and legitimate enterprises and have an appropriate ESMS that will allow them to operate in a manner consistent with the requirements of this Performance Standard, except for paragraphs 18–19, and 27–29.

25. The client will establish policies and procedures for managing and monitoring the performance of such third party employers in relation to the requirements of this Performance Standard. In addition, the client will use commercially reasonable efforts to incorporate these requirements in contractual agreements with such third party employers.

26. The client will ensure that contracted workers, covered in paragraphs 24–25 of this Performance Standard, have access to a grievance mechanism. In cases where the third party is not able to provide a grievance mechanism the client will extend its own grievance mechanism to serve workers engaged by the third party.

[13] Trafficking in persons is defined as the recruitment, transportation, transfer, harboring, or receipt of persons, by means of the threat or use of force or other forms of coercion, abduction, fraud, deception, abuse of power, or of a position of vulnerability, or of the giving or receiving of payments or benefits to achieve the consent of a person having control over another person, for the purpose of exploitation. Women and children are particularly vulnerable to trafficking practices.

[14] Defined as the exercise of professional skill, diligence, prudence, and foresight that would reasonably be expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances, globally or regionally.

Supply Chain

27. Where there is a high risk of child labor or forced labor[15] in the primary supply chain, the client will identify those risks consistent with paragraphs 21 and 22 above. If child labor or forced labor cases are identified, the client will take appropriate steps to remedy them. The client will monitor its primary supply chain on an ongoing basis in order to identify any significant changes in its supply chain and if new risks or incidents of child and/or forced labor are identified, the client will take appropriate steps to remedy them.

28. Additionally, where there is a high risk of significant safety issues related to supply chain workers, the client will introduce procedures and mitigation measures to ensure that primary suppliers within the supply chain are taking steps to prevent or to correct life-threatening situations.

29. The ability of the client to fully address these risks will depend upon the client's level of management control or influence over its primary suppliers. Where remedy is not possible, the client will shift the project's primary supply chain over time to suppliers that can demonstrate that they are complying with this Performance Standard.

[15] The potential risk of child labor and forced labor will be determined during the risks and impacts identification process as required in Performance Standard 1.

International Finance Corporation
World Bank Group

Performance Standard 3
Resource Efficiency and Pollution Prevention

January 1, 2012

Introduction

1. Performance Standard 3 recognizes that increased economic activity and urbanization often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels.[1] There is also a growing global consensus that the current and projected atmospheric concentration of greenhouse gases (GHG) threatens the public health and welfare of current and future generations. At the same time, more efficient and effective resource use and pollution prevention[2] and GHG emission avoidance and mitigation technologies and practices have become more accessible and achievable in virtually all parts of the world. These are often implemented through continuous improvement methodologies similar to those used to enhance quality or productivity, which are generally well known to most industrial, agricultural, and service sector companies.

2. This Performance Standard outlines a project-level approach to resource efficiency and pollution prevention and control in line with internationally disseminated technologies and practices. In addition, this Performance Standard promotes the ability of private sector companies to adopt such technologies and practices as far as their use is feasible in the context of a project that relies on commercially available skills and resources.

Objectives

- To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities.
- To promote more sustainable use of resources, including energy and water.
- To reduce project-related GHG emissions.

Scope of Application

3. The applicability of this Performance Standard is established during the environmental and social risks and impacts identification process. The implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the client's Environmental and Social Management System, the elements of which are outlined in Performance Standard 1.

Requirements

4. During the project life-cycle, the client will consider ambient conditions and apply technically and financially feasible resource efficiency and pollution prevention principles and techniques that are best suited to avoid, or where avoidance is not possible, minimize adverse impacts on human health and the environment.[3] The principles and techniques applied during the project life-cycle will be

[1] For the purposes of this Performance Standard, the term "pollution" is used to refer to both hazardous and non-hazardous chemical pollutants in the solid, liquid, or gaseous phases, and includes other components such as pests, pathogens, thermal discharge to water, GHG emissions, nuisance odors, noise, vibration, radiation, electromagnetic energy, and the creation of potential visual impacts including light.

[2] For the purpose of this Performance Standard, the term "pollution prevention" does not mean absolute elimination of emissions, but the avoidance at source whenever possible, and, if not possible, then subsequent minimization of pollution to the extent that the Performance Standard objectives are satisfied.

[3] Technical feasibility is based on whether the proposed measures and actions can be implemented with commercially available skills, equipment, and materials, taking into consideration prevailing local factors such as climate, geography, infrastructure, security, governance, capacity and operational reliability. Financial feasibility is

tailored to the hazards and risks associated with the nature of the project and consistent with good international industry practice (GIIP),[4] as reflected in various internationally recognized sources, including the World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines).

5. The client will refer to the EHS Guidelines or other internationally recognized sources, as appropriate, when evaluating and selecting resource efficiency and pollution prevention and control techniques for the project. The EHS Guidelines contain the performance levels and measures that are normally acceptable and applicable to projects. When host country regulations differ from the levels and measures presented in the EHS Guidelines, clients will be required to achieve whichever is more stringent. If less stringent levels or measures than those provided in the EHS Guidelines are appropriate in view of specific project circumstances, the client will provide full and detailed justification for any proposed alternatives through the environmental and social risks and impacts identification and assessment process. This justification must demonstrate that the choice for any alternate performance levels is consistent with the objectives of this Performance Standard.

Resource Efficiency

6. The client will implement technically and financially feasible and cost effective[5] measures for improving efficiency in its consumption of energy, water, as well as other resources and material inputs, with a focus on areas that are considered core business activities. Such measures will integrate the principles of cleaner production into product design and production processes with the objective of conserving raw materials, energy, and water. Where benchmarking data are available, the client will make a comparison to establish the relative level of efficiency.

Greenhouse Gases

7. In addition to the resource efficiency measures described above, the client will consider alternatives and implement technically and financially feasible and cost-effective options to reduce project-related GHG emissions during the design and operation of the project. These options may include, but are not limited to, alternative project locations, adoption of renewable or low carbon energy sources, sustainable agricultural, forestry and livestock management practices, the reduction of fugitive emissions and the reduction of gas flaring.

8. For projects that are expected to or currently produce more than 25,000 tonnes of CO_2-equivalent annually,[6] the client will quantify direct emissions from the facilities owned or controlled within the physical project boundary,[7] as well as indirect emissions associated with the off-site

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based on commercial considerations, including relative magnitude of the incremental cost of adopting such measures and actions compared to the project's investment, operating, and maintenance costs.

[4] GIIP is defined as the exercise of professional skill, diligence, prudence, and foresight that would reasonably be expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances globally or regionally. The outcome of such exercise should be that the project employs the most appropriate technologies in the project-specific circumstances.

[5] Cost-effectiveness is determined according to the capital and operational cost and financial benefits of the measure considered over the life of the measure. For the purpose of this Performance Standard, a resource efficiency or GHG emissions reduction measure is considered cost-effective if it is expected to provide a risk-rated return on investment at least comparable to the project itself.

[6] The quantification of emissions should consider all significant sources of greenhouse gas emissions, including non-energy related sources such as methane and nitrous oxide, among others.

[7] Project-induced changes in soil carbon content or above ground biomass, and project-induced decay of organic matter may contribute to direct emissions sources and shall be included in this emissions quantification where such emissions are expected to be significant.

production of energy[8] used by the project. Quantification of GHG emissions will be conducted by the client annually in accordance with internationally recognized methodologies and good practice.[9]

Water Consumption
9. When the project is a potentially significant consumer of water, in addition to applying the resource efficiency requirements of this Performance Standard, the client shall adopt measures that avoid or reduce water usage so that the project's water consumption does not have significant adverse impacts on others. These measures include, but are not limited to, the use of additional technically feasible water conservation measures within the client's operations, the use of alternative water supplies, water consumption offsets to reduce total demand for water resources to within the available supply, and evaluation of alternative project locations.

Pollution Prevention

10. The client will avoid the release of pollutants or, when avoidance is not feasible, minimize and/or control the intensity and mass flow of their release. This applies to the release of pollutants to air, water, and land due to routine, non-routine, and accidental circumstances with the potential for local, regional, and transboundary impacts.[10] Where historical pollution such as land or ground water contamination exists, the client will seek to determine whether it is responsible for mitigation measures. If it is determined that the client is legally responsible, then these liabilities will be resolved in accordance with national law, or where this is silent, with GIIP.[11]

11. To address potential adverse project impacts on existing ambient conditions,[12] the client will consider relevant factors, including, for example (i) existing ambient conditions; (ii) the finite assimilative capacity[13] of the environment; (iii) existing and future land use; (iv) the project's proximity to areas of importance to biodiversity; and (v) the potential for cumulative impacts with uncertain and/or irreversible consequences. In addition to applying resource efficiency and pollution control measures as required in this Performance Standard, when the project has the potential to constitute a significant source of emissions in an already degraded area, the client will consider additional strategies and adopt measures that avoid or reduce negative effects. These strategies include, but are not limited to, evaluation of project location alternatives and emissions offsets.

Wastes
12. The client will avoid the generation of hazardous and non-hazardous waste materials. Where waste generation cannot be avoided, the client will reduce the generation of waste, and recover and reuse waste in a manner that is safe for human health and the environment. Where waste cannot be recovered or reused, the client will treat, destroy, or dispose of it in an environmentally sound manner that includes the appropriate control of emissions and residues resulting from the handling and processing of the waste material. If the generated waste is considered hazardous,[14] the client will

[8] Refers to the off-site generation by others of electricity, and heating and cooling energy used in the project.

[9] Estimation methodologies are provided by the Intergovernmental Panel on Climate Change, various international organizations, and relevant host country agencies.

[10] Transboundary pollutants include those covered under the Convention on Long-Range Transboundary Air Pollution.

[11] This may require coordination with national and local government, communities, and the contributors to the contamination, and that any assessment follows a risk-based approach consistent with GIIP as reflected in the EHS Guidelines.

[12] Such as air, surface and groundwater, and soils.

[13] The capacity of the environment for absorbing an incremental load of pollutants while remaining below a threshold of unacceptable risk to human health and the environment.

[14] As defined by international conventions or local legislation.

adopt GIIP alternatives for its environmentally sound disposal while adhering to the limitations applicable to its transboundary movement.[15] When hazardous waste disposal is conducted by third parties, the client will use contractors that are reputable and legitimate enterprises licensed by the relevant government regulatory agencies and obtain chain of custody documentation to the final destination. The client should ascertain whether licensed disposal sites are being operated to acceptable standards and where they are, the client will use these sites. Where this is not the case, clients should reduce waste sent to such sites and consider alternative disposal options, including the possibility of developing their own recovery or disposal facilities at the project site.

Hazardous Materials Management

13. Hazardous materials are sometimes used as raw material or produced as product by the project. The client will avoid or, when avoidance is not possible, minimize and control the release of hazardous materials. In this context, the production, transportation, handling, storage, and use of hazardous materials for project activities should be assessed. The client will consider less hazardous substitutes where hazardous materials are intended to be used in manufacturing processes or other operations. The client will avoid the manufacture, trade, and use of chemicals and hazardous materials subject to international bans or phase-outs due to their high toxicity to living organisms, environmental persistence, potential for bioaccumulation, or potential for depletion of the ozone layer.[16]

Pesticide Use and Management

14. The client will, where appropriate, formulate and implement an integrated pest management (IPM) and/or integrated vector management (IVM) approach targeting economically significant pest infestations and disease vectors of public health significance. The client's IPM and IVM program will integrate coordinated use of pest and environmental information along with available pest control methods, including cultural practices, biological, genetic, and, as a last resort, chemical means to prevent economically significant pest damage and/or disease transmission to humans and animals.

15. When pest management activities include the use of chemical pesticides, the client will select chemical pesticides that are low in human toxicity, that are known to be effective against the target species, and that have minimal effects on non-target species and the environment. When the client selects chemical pesticides, the selection will be based upon requirements that the pesticides be packaged in safe containers, be clearly labeled for safe and proper use, and that the pesticides have been manufactured by an entity currently licensed by relevant regulatory agencies.

16. The client will design its pesticide application regime to (i) avoid damage to natural enemies of the target pest, and where avoidance is not possible, minimize, and (ii) avoid the risks associated with the development of resistance in pests and vectors, and where avoidance is not possible minimize. In addition, pesticides will be handled, stored, applied, and disposed of in accordance with the Food and Agriculture Organization's International Code of Conduct on the Distribution and Use of Pesticides or other GIIP.

17. The client will not purchase, store, use, manufacture, or trade in products that fall in WHO Recommended Classification of Pesticides by Hazard Class Ia (extremely hazardous); or Ib (highly

[15] Transboundary movement of hazardous materials should be consistent with national, regional and international law, including the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal and the London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter.

[16] Consistent with the objectives of the Stockholm Convention on Persistent Organic Pollutants and the Montreal Protocol on Substances that Deplete the Ozone Layer. Similar considerations will apply to certain World Health Organization (WHO) classes of pesticides.

hazardous). The client will not purchase, store, use, manufacture or trade in Class II (moderately hazardous) pesticides, unless the project has appropriate controls on manufacture, procurement, or distribution and/or use of these chemicals. These chemicals should not be accessible to personnel without proper training, equipment, and facilities to handle, store, apply, and dispose of these products properly.

International Finance Corporation
World Bank Group

Performance Standard 4
Community Health, Safety, and Security

January 1, 2012

Introduction

1. Performance Standard 4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. In addition, communities that are already subjected to impacts from climate change may also experience an acceleration and/or intensification of impacts due to project activities. While acknowledging the public authorities' role in promoting the health, safety, and security of the public, this Performance Standard addresses the client's responsibility to avoid or minimize the risks and impacts to community health, safety, and security that may arise from project related-activities, with particular attention to vulnerable groups.

2. In conflict and post-conflict areas, the level of risks and impacts described in this Performance Standard may be greater. The risks that a project could exacerbate an already sensitive local situation and stress scarce local resources should not be overlooked as it may lead to further conflict.

Objectives

- To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances.
- To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.

Scope of Application

3. The applicability of this Performance Standard is established during the environmental and social risks and impacts identification process. The implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the client's Environmental and Social Management System, the elements of which are outlined in Performance Standard 1.

4. This Performance Standard addresses potential risks and impacts to the Affected Communities from project activities. Occupational health and safety requirements for workers are included in Performance Standard 2, and environmental standards to avoid or minimize impacts on human health and the environment due to pollution are included in Performance Standard 3.

Requirements

Community Health and Safety

5. The client will evaluate the risks and impacts to the health and safety of the Affected Communities during the project life-cycle and will establish preventive and control measures consistent with good international industry practice (GIIP),[1] such as in the World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines) or other internationally recognized sources. The client will identify risks and impacts and propose mitigation measures that are commensurate with their nature and magnitude. These measures will favor the avoidance of risks and impacts over minimization.

[1] Defined as the exercise of professional skill, diligence, prudence, and foresight that would reasonably be expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances globally or regionally.

Infrastructure and Equipment Design and Safety

6. The client will design, construct, operate, and decommission the structural elements or components of the project in accordance with GIIP, taking into consideration safety risks to third parties or Affected Communities. When new buildings and structures will be accessed by members of the public, the client will consider incremental risks of the public's potential exposure to operational accidents and/or natural hazards and be consistent with the principles of universal access. Structural elements will be designed and constructed by competent professionals, and certified or approved by competent authorities or professionals. When structural elements or components, such as dams, tailings dams, or ash ponds are situated in high-risk locations, and their failure or malfunction may threaten the safety of communities, the client will engage one or more external experts with relevant and recognized experience in similar projects, separate from those responsible for the design and construction, to conduct a review as early as possible in project development and throughout the stages of project design, construction, operation, and decommissioning. For projects that operate moving equipment on public roads and other forms of infrastructure, the client will seek to avoid the occurrence of incidents and injuries to members of the public associated with the operation of such equipment.

Hazardous Materials Management and Safety

7. The client will avoid or minimize the potential for community exposure to hazardous materials and substances that may be released by the project. Where there is a potential for the public (including workers and their families) to be exposed to hazards, particularly those that may be life-threatening, the client will exercise special care to avoid or minimize their exposure by modifying, substituting, or eliminating the condition or material causing the potential hazards. Where hazardous materials are part of existing project infrastructure or components, the client will exercise special care when conducting decommissioning activities in order to avoid exposure to the community. The client will exercise commercially reasonable efforts to control the safety of deliveries of hazardous materials, and of transportation and disposal of hazardous wastes, and will implement measures to avoid or control community exposure to pesticides, in accordance with the requirements of Performance Standard 3.

Ecosystem Services

8. The project's direct impacts on priority ecosystem services may result in adverse health and safety risks and impacts to Affected Communities. With respect to this Performance Standard, ecosystem services are limited to provisioning and regulating services as defined in paragraph 2 of Performance Standard 6. For example, land use changes or the loss of natural buffer areas such as wetlands, mangroves, and upland forests that mitigate the effects of natural hazards such as flooding, landslides, and fire, may result in increased vulnerability and community safety-related risks and impacts. The diminution or degradation of natural resources, such as adverse impacts on the quality, quantity, and availability of freshwater,[2] may result in health-related risks and impacts. Where appropriate and feasible, the client will identify those risks and potential impacts on priority ecosystem services that may be exacerbated by climate change. Adverse impacts should be avoided, and if these impacts are unavoidable, the client will implement mitigation measures in accordance with paragraphs 24 and 25 of Performance Standard 6. With respect to the use of and loss of access to provisioning services, clients will implement mitigation measures in accordance with paragraphs 25–29 of Performance Standard 5.

[2] Freshwater is an example of provisioning ecosystem services.

Community Exposure to Disease

9. The client will avoid or minimize the potential for community exposure to water-borne, water-based, water-related, and vector-borne diseases, and communicable diseases that could result from project activities, taking into consideration differentiated exposure to and higher sensitivity of vulnerable groups. Where specific diseases are endemic in communities in the project area of influence, the client is encouraged to explore opportunities during the project life-cycle to improve environmental conditions that could help minimize their incidence.

10. The client will avoid or minimize transmission of communicable diseases that may be associated with the influx of temporary or permanent project labor.

Emergency Preparedness and Response

11. In addition to the emergency preparedness and response requirements described in Performance Standard 1, the client will also assist and collaborate with the Affected Communities, local government agencies, and other relevant parties, in their preparations to respond effectively to emergency situations, especially when their participation and collaboration are necessary to respond to such emergency situations. If local government agencies have little or no capacity to respond effectively, the client will play an active role in preparing for and responding to emergencies associated with the project. The client will document its emergency preparedness and response activities, resources, and responsibilities, and will disclose appropriate information to Affected Communities, relevant government agencies, or other relevant parties.

Security Personnel

12. When the client retains direct or contracted workers to provide security to safeguard its personnel and property, it will assess risks posed by its security arrangements to those within and outside the project site. In making such arrangements, the client will be guided by the principles of proportionality and good international practice[3] in relation to hiring, rules of conduct, training, equipping, and monitoring of such workers, and by applicable law. The client will make reasonable inquiries to ensure that those providing security are not implicated in past abuses; will train them adequately in the use of force (and where applicable, firearms), and appropriate conduct toward workers and Affected Communities; and require them to act within the applicable law. The client will not sanction any use of force except when used for preventive and defensive purposes in proportion to the nature and extent of the threat. The client will provide a grievance mechanism for Affected Communities to express concerns about the security arrangements and acts of security personnel.

13. The client will assess and document risks arising from the project's use of government security personnel deployed to provide security services. The client will seek to ensure that security personnel will act in a manner consistent with paragraph 12 above, and encourage the relevant public authorities to disclose the security arrangements for the client's facilities to the public, subject to overriding security concerns.

14. The client will consider and, where appropriate, investigate all allegations of unlawful or abusive acts of security personnel, take action (or urge appropriate parties to take action) to prevent recurrence, and report unlawful and abusive acts to public authorities.

[3] Including practice consistent with the United Nation's (UN) Code of Conduct for Law Enforcement Officials, and UN Basic Principles on the Use of Force and Firearms by Law Enforcement Officials.

Performance Standard 5
Land Acquisition and Involuntary Resettlement

January 1, 2012

Introduction

1. Performance Standard 5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood[1]) as a result of project-related land acquisition[2] and/or restrictions on land use. Resettlement is considered involuntary when affected persons or communities do not have the right to refuse land acquisition or restrictions on land use that result in physical or economic displacement. This occurs in cases of (i) lawful expropriation or temporary or permanent restrictions on land use and (ii) negotiated settlements in which the buyer can resort to expropriation or impose legal restrictions on land use if negotiations with the seller fail.

2. Unless properly managed, involuntary resettlement may result in long-term hardship and impoverishment for the Affected Communities and persons, as well as environmental damage and adverse socio-economic impacts in areas to which they have been displaced. For these reasons, involuntary resettlement should be avoided. However, where involuntary resettlement is unavoidable, it should be minimized and appropriate measures to mitigate adverse impacts on displaced persons and host communities[3] should be carefully planned and implemented. The government often plays a central role in the land acquisition and resettlement process, including the determination of compensation, and is therefore an important third party in many situations. Experience demonstrates that the direct involvement of the client in resettlement activities can result in more cost-effective, efficient, and timely implementation of those activities, as well as in the introduction of innovative approaches to improving the livelihoods of those affected by resettlement.

3. To help avoid expropriation and eliminate the need to use governmental authority to enforce relocation, clients are encouraged to use negotiated settlements meeting the requirements of this Performance Standard, even if they have the legal means to acquire land without the seller's consent.

Objectives

- To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs.
- To avoid forced eviction.
- To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost[4] and (ii) ensuring

[1] The term "livelihood" refers to the full range of means that individuals, families, and communities utilize to make a living, such as wage-based income, agriculture, fishing, foraging, other natural resource-based livelihoods, petty trade, and bartering.

[2] Land acquisition includes both outright purchases of property and acquisition of access rights, such as easements or rights of way.

[3] A host community is any community receiving displaced persons.

[4] Replacement cost is defined as the market value of the assets plus transaction costs. In applying this method of valuation, depreciation of structures and assets should not be taken into account. Market value is defined as the value required to allow Affected Communities and persons to replace lost assets with assets of similar value. The valuation method for determining replacement cost should be documented and included in applicable Resettlement and/or Livelihood Restoration plans (see paragraphs 18 and 25).

that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected.
- To improve, or restore, the livelihoods and standards of living of displaced persons.
- To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure[5] at resettlement sites.

Scope of Application

4. The applicability of this Performance Standard is established during the environmental and social risks and impacts identification process. The implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the client's Environmental and Social Management System, the elements of which are outlined in Performance Standard 1.

5. This Performance Standard applies to physical and/or economic displacement resulting from the following types of land-related transactions:

- Land rights or land use rights acquired through expropriation or other compulsory procedures in accordance with the legal system of the host country;
- Land rights or land use rights acquired through negotiated settlements with property owners or those with legal rights to the land if failure to reach settlement would have resulted in expropriation or other compulsory procedures;[6]
- Project situations where involuntary restrictions on land use and access to natural resources cause a community or groups within a community to lose access to resource usage where they have traditional or recognizable usage rights;[7]
- Certain project situations requiring evictions of people occupying land without formal, traditional, or recognizable usage rights;[8] or
- Restriction on access to land or use of other resources including communal property and natural resources such as marine and aquatic resources, timber and non-timber forest products, freshwater, medicinal plants, hunting and gathering grounds and grazing and cropping areas.[9]

6. This Performance Standard does not apply to resettlement resulting from voluntary land transactions (i.e., market transactions in which the seller is not obliged to sell and the buyer cannot resort to expropriation or other compulsory procedures sanctioned by the legal system of the host country if negotiations fail). It also does not apply to impacts on livelihoods where the project is not changing the land use of the affected groups or communities.[10]

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[5] Security of tenure means that resettled individuals or communities are resettled to a site that they can legally occupy and where they are protected from the risk of eviction.

[6] This also applies to customary or traditional rights recognized or recognizable under the laws of the host country. The negotiations may be carried out by the government or by the company (in some circumstances, as an agent of the government).

[7] In such situations, affected persons frequently do not have formal ownership. This may include freshwater and marine environments. This Performance Standard may also apply when project-related biodiversity areas or legally designated buffer zones are established but not acquired by the client.

[8] While some people do not have rights over the land they occupy, this Performance Standard requires that non-land assets be retained, replaced, or compensated for; relocation take place with security of tenure; and lost livelihoods be restored.

[9] Natural resource assets referred to in this Performance Standard are equivalent to ecosystem provisioning services as described in Performance Standard 6.

[10] More generalized impacts on communities or groups of people are covered in Performance Standard 1. For example, disruption of access to mineral deposits by artisanal miners is covered by Performance Standard 1.

7. Where project impacts on land, assets, or access to assets become significantly adverse at any stage of the project, the client should consider applying requirements of this Performance Standard, even where no land acquisition or land use restriction is involved.

Requirements

General

Project Design

8. The client will consider feasible alternative project designs to avoid or minimize physical and/or economic displacement, while balancing environmental, social, and financial costs and benefits, paying particular attention to impacts on the poor and vulnerable.

Compensation and Benefits for Displaced Persons

9. When displacement cannot be avoided, the client will offer displaced communities and persons compensation for loss of assets at full replacement cost and other assistance[11] to help them improve or restore their standards of living or livelihoods, as provided in this Performance Standard. Compensation standards will be transparent and applied consistently to all communities and persons affected by the displacement. Where livelihoods of displaced persons are land-based,[12] or where land is collectively owned, the client will, where feasible,[13] offer the displaced land-based compensation. The client will take possession of acquired land and related assets only after compensation has been made available[14] and, where applicable, resettlement sites and moving allowances have been provided to the displaced persons in addition to compensation.[15] The client will also provide opportunities to displaced communities and persons to derive appropriate development benefits from the project.

Community Engagement

10. The client will engage with Affected Communities, including host communities, through the process of stakeholder engagement described in Performance Standard 1. Decision-making processes related to resettlement and livelihood restoration should include options and alternatives, where applicable. Disclosure of relevant information and participation of Affected Communities and persons will continue during the planning, implementation, monitoring, and evaluation of compensation payments, livelihood restoration activities, and resettlement to achieve outcomes that are consistent with the objectives of this Performance Standard.[16] Additional provisions apply to consultations with Indigenous Peoples, in accordance with Performance Standard 7.

[11] As described in paragraphs 19 and 26.

[12] The term "land-based" includes livelihood activities such as subsistence cropping and grazing of livestock as well as the harvesting of natural resources.

[13] Refer to paragraph 26 of this Performance Standard for further requirements.

[14] In certain cases it may not be feasible to pay compensation to all those affected before taking possession of the land, for example when the ownership of the land in question is in dispute. Such circumstances shall be identified and agreed on a case-by-case basis, and compensation funds shall be made available for example through deposit into an escrow account before displacement takes place.

[15] Unless government-managed resettlement is involved and where the client has no direct influence over the timing of compensation payments. Such cases should be handled in accordance with paragraphs 27–29 of this Performance Standard. Staggered compensation payments may be made where one-off cash payments would demonstrably undermine social and/or resettlement objectives, or where there are ongoing impacts to livelihood activities.

[16] The consultation process should ensure that women's perspectives are obtained and their interests factored into all aspects of resettlement planning and implementation. Addressing livelihood impacts may require intra-household analysis in cases where women's and men's livelihoods are affected differently. Women's and men's preferences in terms of compensation mechanisms, such as compensation in kind rather than in cash, should be explored.

Grievance Mechanism

11. The client will establish a grievance mechanism consistent with Performance Standard 1 as early as possible in the project development phase. This will allow the client to receive and address specific concerns about compensation and relocation raised by displaced persons or members of host communities in a timely fashion, including a recourse mechanism designed to resolve disputes in an impartial manner.

Resettlement and Livelihood Restoration Planning and Implementation

12. Where involuntary resettlement is unavoidable, either as a result of a negotiated settlement or expropriation, a census will be carried out to collect appropriate socio-economic baseline data to identify the persons who will be displaced by the project, determine who will be eligible for compensation and assistance,[17] and discourage ineligible persons, such as opportunistic settlers, from claiming benefits. In the absence of host government procedures, the client will establish a cut-off date for eligibility. Information regarding the cut-off date will be well documented and disseminated throughout the project area.

13. In cases where affected persons reject compensation offers that meet the requirements of this Performance Standard and, as a result, expropriation or other legal procedures are initiated, the client will explore opportunities to collaborate with the responsible government agency, and, if permitted by the agency, play an active role in resettlement planning, implementation, and monitoring (see paragraphs 30–32).

14. The client will establish procedures to monitor and evaluate the implementation of a Resettlement Action Plan or Livelihood Restoration Plan (see paragraphs 19 and 25) and take corrective action as necessary. The extent of monitoring activities will be commensurate with the project's risks and impacts. For projects with significant involuntary resettlement risks, the client will retain competent resettlement professionals to provide advice on compliance with this Performance Standard and to verify the client's monitoring information. Affected persons will be consulted during the monitoring process.

15. Implementation of a Resettlement Action Plan or Livelihood Restoration Plan will be considered completed when the adverse impacts of resettlement have been addressed in a manner that is consistent with the relevant plan as well as the objectives of this Performance Standard. It may be necessary for the client to commission an external completion audit of the Resettlement Action Plan or Livelihood Restoration Plan to assess whether the provisions have been met, depending on the scale and/or complexity of physical and economic displacement associated with a project. The completion audit should be undertaken once all mitigation measures have been substantially completed and once displaced persons are deemed to have been provided adequate opportunity and assistance to sustainably restore their livelihoods. The completion audit will be undertaken by competent resettlement professionals once the agreed monitoring period is concluded. The completion audit will include, at a minimum, a review of the totality of mitigation measures implemented by the Client, a comparison of implementation outcomes against agreed objectives, and a conclusion as to whether the monitoring process can be ended.[18]

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[17] Documentation of ownership or occupancy and compensation arrangements should be issued in the names of both spouses or heads of households, and other resettlement assistance, such as skills training, access to credit, and job opportunities, should be equally available to women and adapted to their needs. Where national law and tenure systems do not recognize the rights of women to hold or contract in property, measures should be considered to provide women as much protection as possible with the objective to achieve equity with men.

[18] The completion audit of the Resettlement Action Plan and/or Livelihood Restoration Plan, will be undertaken by external resettlement experts once the agreed monitoring period is concluded, and will involve a more in-depth assessment than regular resettlement monitoring activities, including at a minimum a review of all mitigation

16. Where the exact nature or magnitude of the land acquisition or restrictions on land use related to a project with potential to cause physical and/or economic displacement is unknown due to the stage of project development, the client will develop a Resettlement and/or Livelihood Restoration Framework outlining general principles compatible with this Performance Standard. Once the individual project components are defined and the necessary information becomes available, such a framework will be expanded into a specific Resettlement Action Plan or Livelihood Restoration Plan and procedures in accordance with paragraphs 19 and 25 below.

Displacement

17. Displaced persons may be classified as persons (i) who have formal legal rights to the land or assets they occupy or use; (ii) who do not have formal legal rights to land or assets, but have a claim to land that is recognized or recognizable under national law;[19] or (iii) who have no recognizable legal right or claim to the land or assets they occupy or use. The census will establish the status of the displaced persons.

18. Project-related land acquisition and/or restrictions on land use may result in the physical displacement of people as well as their economic displacement. Consequently, requirements of this Performance Standard in respect of physical displacement and economic displacement may apply simultaneously.[20]

Physical Displacement

19. In the case of physical displacement, the client will develop a Resettlement Action Plan that covers, at a minimum, the applicable requirements of this Performance Standard regardless of the number of people affected. This will include compensation at full replacement cost for land and other assets lost. The Plan will be designed to mitigate the negative impacts of displacement; identify development opportunities; develop a resettlement budget and schedule; and establish the entitlements of all categories of affected persons (including host communities). Particular attention will be paid to the needs of the poor and the vulnerable. The client will document all transactions to acquire land rights, as well as compensation measures and relocation activities.

20. If people living in the project area are required to move to another location, the client will (i) offer displaced persons choices among feasible resettlement options, including adequate replacement housing or cash compensation where appropriate; and (ii) provide relocation assistance suited to the needs of each group of displaced persons. New resettlement sites built for displaced persons must offer improved living conditions. The displaced persons' preferences with respect to relocating in preexisting communities and groups will be taken into consideration. Existing social and cultural institutions of the displaced persons and any host communities will be respected.

21. In the case of physically displaced persons under paragraph 17 (i) or (ii), the client will offer the choice of replacement property of equal or higher value, security of tenure, equivalent or better characteristics, and advantages of location or cash compensation where appropriate. Compensation

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measures with respect to the physical and/or economic displacement implemented by the Client, a comparison of implementation outcomes against agreed objectives, a conclusion as to whether the monitoring process can be ended and, where necessary, a Corrective Action Plan listing outstanding actions necessary to met the objectives.

[19] Such claims could be derived from adverse possession or from customary or traditional tenure arrangements.

[20] Where a project results in both physical and economic displacement, the requirements of paragraphs 25 and 26 (Economic Displacement) should be incorporated into the Resettlement Action Plan or Framework (i.e., there is no need to have a separate Resettlement Action Plan and Livelihood Restoration Plan).

in kind should be considered in lieu of cash. Cash compensation levels should be sufficient to replace the lost land and other assets at full replacement cost in local markets.[21]

22. In the case of physically displaced persons under paragraph 17 (iii), the client will offer them a choice of options for adequate housing with security of tenure so that they can resettle legally without having to face the risk of forced eviction. Where these displaced persons own and occupy structures, the client will compensate them for the loss of assets other than land, such as dwellings and other improvements to the land, at full replacement cost, provided that these persons have been occupying the project area prior to the cut-off date for eligibility. Based on consultation with such displaced persons, the client will provide relocation assistance sufficient for them to restore their standard of living at an adequate alternative site.[22]

23. The client is not required to compensate or assist those who encroach on the project area after the cut-off date for eligibility, provided the cut-off date has been clearly established and made public.

24. Forced evictions[23] will not be carried out except in accordance with law and the requirements of this Performance Standard.

Economic Displacement

25. In the case of projects involving economic displacement only, the client will develop a Livelihood Restoration Plan to compensate affected persons and/or communities and offer other assistance that meet the objectives of this Performance Standard. The Livelihood Restoration Plan will establish the entitlements of affected persons and/or communities and will ensure that these are provided in a transparent, consistent, and equitable manner. The mitigation of economic displacement will be considered complete when affected persons or communities have received compensation and other assistance according to the requirements of the Livelihood Restoration Plan and this Performance Standard, and are deemed to have been provided with adequate opportunity to reestablish their livelihoods.

26. If land acquisition or restrictions on land use result in economic displacement defined as loss of assets and/or means of livelihood, regardless of whether or not the affected people are physically displaced, the client will meet the requirements in paragraphs 27–29 below, as applicable.

27. Economically displaced persons who face loss of assets or access to assets will be compensated for such loss at full replacement cost.

- In cases where land acquisition or restrictions on land use affect commercial structures, affected business owners will be compensated for the cost of reestablishing commercial activities elsewhere, for lost net income during the

[21] Payment of cash compensation for lost assets may be appropriate where (i) livelihoods are not land-based; (ii) livelihoods are land-based but the land taken for the project is a small fraction of the affected asset and the residual land is economically viable; or (iii) active markets for land, housing, and labor exist, displaced persons use such markets, and there is sufficient supply of land and housing.

[22] Relocation of informal settlers in urban areas may involve trade-offs. For example, the relocated families may gain security of tenure, but they may lose advantages of location. Changes in location that may affect livelihood opportunities should be addressed in accordance with the principles of this Performance Standard (see in particular paragraph 25).

[23] The permanent or temporary removal against the will of individuals, families, and/or communities from the homes and/or lands which they occupy without the provision of, and access to, appropriate forms of legal and other protection.

period of transition, and for the costs of the transfer and reinstallation of the plant, machinery, or other equipment.

- In cases affecting persons with legal rights or claims to land which are recognized or recognizable under national law (see paragraph 17 (i) and (ii)), replacement property (e.g., agricultural or commercial sites) of equal or greater value will be provided, or, where appropriate, cash compensation at full replacement cost.
- Economically displaced persons who are without legally recognizable claims to land (see paragraph 17 (iii)) will be compensated for lost assets other than land (such as crops, irrigation infrastructure and other improvements made to the land), at full replacement cost. The client is not required to compensate or assist opportunistic settlers who encroach on the project area after the cut-off date for eligibility.

28. In addition to compensation for lost assets, if any, as required under paragraph 27, economically displaced persons whose livelihoods or income levels are adversely affected will also be provided opportunities to improve, or at least restore, their means of income-earning capacity, production levels, and standards of living:

- For persons whose livelihoods are land-based, replacement land that has a combination of productive potential, locational advantages, and other factors at least equivalent to that being lost should be offered as a matter of priority.
- For persons whose livelihoods are natural resource-based and where project-related restrictions on access envisaged in paragraph 5 apply, implementation of measures will be made to either allow continued access to affected resources or provide access to alternative resources with equivalent livelihood-earning potential and accessibility. Where appropriate, benefits and compensation associated with natural resource usage may be collective in nature rather than directly oriented towards individuals or households.
- If circumstances prevent the client from providing land or similar resources as described above, alternative income earning opportunities may be provided, such as credit facilities, training, cash, or employment opportunities. Cash compensation alone, however, is frequently insufficient to restore livelihoods.

29. Transitional support should be provided as necessary to all economically displaced persons, based on a reasonable estimate of the time required to restore their income-earning capacity, production levels, and standards of living.

Private Sector Responsibilities Under Government-Managed Resettlement

30. Where land acquisition and resettlement are the responsibility of the government, the client will collaborate with the responsible government agency, to the extent permitted by the agency, to achieve outcomes that are consistent with this Performance Standard. In addition, where government capacity is limited, the client will play an active role during resettlement planning, implementation, and monitoring, as described below.

31. In the case of acquisition of land rights or access to land through compulsory means or negotiated settlements involving physical displacement, the client will identify and describe[24] government resettlement measures. If these measures do not meet the relevant requirements of this Performance Standard, the client will prepare a Supplemental Resettlement Plan that, together with

[24] Government documents, where available, may be used to identify such measures.

the documents prepared by the responsible government agency, will address the relevant requirements of this Performance Standard (the General Requirements and requirements for Physical Displacement and Economic Displacement above). The client will need to include in its Supplemental Resettlement Plan, at a minimum (i) identification of affected people and impacts; (ii) a description of regulated activities, including the entitlements of displaced persons provided under applicable national laws and regulations; (iii) the supplemental measures to achieve the requirements of this Performance Standard as described in paragraphs 19–29 in a way that is permitted by the responsible agency and implementation time schedule; and (iv) the financial and implementation responsibilities of the client in the execution of its Supplemental Resettlement Plan.

32. In the case of projects involving economic displacement only, the client will identify and describe the measures that the responsible government agency plans to use to compensate Affected Communities and persons. If these measures do not meet the relevant requirements of this Performance Standard, the client will develop an Environmental and Social Action Plan to complement government action. This may include additional compensation for lost assets, and additional efforts to restore lost livelihoods where applicable.

Performance Standard 6

Biodiversity Conservation and Sustainable Management of Living Natural Resources

January 1, 2012

Introduction

1. Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. The requirements set out in this Performance Standard have been guided by the Convention on Biological Diversity, which defines biodiversity as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species, and of ecosystems."

2. Ecosystem services are the benefits that people, including businesses, derive from ecosystems. Ecosystem services are organized into four types: (i) provisioning services, which are the products people obtain from ecosystems; (ii) regulating services, which are the benefits people obtain from the regulation of ecosystem processes; (iii) cultural services, which are the nonmaterial benefits people obtain from ecosystems; and (iv) supporting services, which are the natural processes that maintain the other services.[1]

3. Ecosystem services valued by humans are often underpinned by biodiversity. Impacts on biodiversity can therefore often adversely affect the delivery of ecosystem services. This Performance Standard addresses how clients can sustainably manage and mitigate impacts on biodiversity and ecosystem services throughout the project's lifecycle.

Objectives

- To protect and conserve biodiversity.
- To maintain the benefits from ecosystem services.
- To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.

Scope of Application

4. The applicability of this Performance Standard is established during the environmental and social risks and impacts identification process. The implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the client's Environmental and Social Management System (ESMS), the elements of which are outlined in Performance Standard 1.

5. Based on the risks and impacts identification process, the requirements of this Performance Standard are applied to projects (i) located in modified, natural, and critical habitats; (ii) that potentially impact on or are dependent on ecosystem services over which the client has direct management control or significant influence; or (iii) that include the production of living natural resources (e.g., agriculture, animal husbandry, fisheries, forestry).

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[1] Examples are as follows: (i) provisioning services may include food, freshwater, timber, fibers, medicinal plants; (ii) regulating services may include surface water purification, carbon storage and sequestration, climate regulation, protection from natural hazards; (iii) cultural services may include natural areas that are sacred sites and areas of importance for recreation and aesthetic enjoyment; and (iv) supporting services may include soil formation, nutrient cycling, primary production.

Requirements

General

6. The risks and impacts identification process as set out in Performance Standard 1 should consider direct and indirect project-related impacts on biodiversity and ecosystem services and identify any significant residual impacts. This process will consider relevant threats to biodiversity and ecosystem services, especially focusing on habitat loss, degradation and fragmentation, invasive alien species, overexploitation, hydrological changes, nutrient loading, and pollution. It will also take into account the differing values attached to biodiversity and ecosystem services by Affected Communities and, where appropriate, other stakeholders. Where paragraphs 13–19 are applicable, the client should consider project-related impacts across the potentially affected landscape or seascape.

7. As a matter of priority, the client should seek to avoid impacts on biodiversity and ecosystem services. When avoidance of impacts is not possible, measures to minimize impacts and restore biodiversity and ecosystem services should be implemented. Given the complexity in predicting project impacts on biodiversity and ecosystem services over the long term, the client should adopt a practice of adaptive management in which the implementation of mitigation and management measures are responsive to changing conditions and the results of monitoring throughout the project's lifecycle.

8. Where paragraphs 13–15 are applicable, the client will retain competent professionals to assist in conducting the risks and impacts identification process. Where paragraphs 16–19 are applicable, the client should retain external experts with appropriate regional experience to assist in the development of a mitigation hierarchy that complies with this Performance Standard and to verify the implementation of those measures.

Protection and Conservation of Biodiversity

9. Habitat is defined as a terrestrial, freshwater, or marine geographical unit or airway that supports assemblages of living organisms and their interactions with the non-living environment. For the purposes of implementation of this Performance Standard, habitats are divided into modified, natural, and critical. Critical habitats are a subset of modified or natural habitats.

10. For the protection and conservation of biodiversity, the mitigation hierarchy includes biodiversity offsets, which may be considered only after appropriate avoidance, minimization, and restoration measures have been applied.[2] A biodiversity offset should be designed and implemented to achieve measurable conservation outcomes[3] that can reasonably be expected to result in no net loss and preferably a net gain of biodiversity; however, a net gain is required in critical habitats. The design of a biodiversity offset must adhere to the "like-for-like or better" principle[4] and must be carried out in

[2] Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development and persisting after appropriate avoidance, minimization and restoration measures have been taken.

[3] Measurable conservation outcomes for biodiversity must be demonstrated in situ (on-the-ground) and on an appropriate geographic scale (e.g., local, landscape-level, national, regional).

[4] The principle of "like-for-like or better" indicates that biodiversity offsets must be designed to conserve the same biodiversity values that are being impacted by the project (an "in-kind" offset). In certain situations, however, areas of biodiversity to be impacted by the project may be neither a national nor a local priority, and there may be other areas of biodiversity with like values that are a higher priority for conservation and sustainable use and under imminent threat or need of protection or effective management. In these situations, it may be appropriate to consider an "out-of-kind" offset that involves "trading up" (i.e., where the offset targets biodiversity of higher

alignment with best available information and current practices. When a client is considering the development of an offset as part of the mitigation strategy, external experts with knowledge in offset design and implementation must be involved.

Modified Habitat

11. Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition.[5] Modified habitats may include areas managed for agriculture, forest plantations, reclaimed[6] coastal zones, and reclaimed wetlands.

12. This Performance Standard applies to those areas of modified habitat that include significant biodiversity value, as determined by the risks and impacts identification process required in Performance Standard 1. The client should minimize impacts on such biodiversity and implement mitigation measures as appropriate.

Natural Habitat

13. Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition.

14. The client will not significantly convert or degrade[7] natural habitats, unless all of the following are demonstrated:

- No other viable alternatives within the region exist for development of the project on modified habitat;
- Consultation has established the views of stakeholders, including Affected Communities, with respect to the extent of conversion and degradation;[8] and
- Any conversion or degradation is mitigated according to the mitigation hierarchy.

15. In areas of natural habitat, mitigation measures will be designed to achieve no net loss[9] of biodiversity where feasible. Appropriate actions include:

- Avoiding impacts on biodiversity through the identification and protection of set-asides;[10]

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priority than that affected by the project) that will, for critical habitats, meet the requirements of paragraph 17 of this Performance Standard.

[5] This excludes habitat that has been converted in anticipation of the project.

[6] Reclamation as used in this context is the process of creating new land from sea or other aquatic areas for productive use.

[7] Significant conversion or degradation is (i) the elimination or severe diminution of the integrity of a habitat caused by a major and/or long-term change in land or water use; or (ii) a modification that substantially minimizes the habitat's ability to maintain viable populations of its native species.

[8] Conducted as part of the stakeholder engagement and consultation process, as described in Performance Standard 1.

[9] No net loss is defined as the point at which project-related impacts on biodiversity are balanced by measures taken to avoid and minimize the project's impacts, to undertake on-site restoration and finally to offset significant residual impacts, if any, on an appropriate geographic scale (e.g., local, landscape-level, national, regional).

[10] Set-asides are land areas within the project site, or areas over which the client has management control, that are excluded from development and are targeted for the implementation of conservation enhancement measures. Set-asides will likely contain significant biodiversity values and/or provide ecosystem services of significance at the local, national and/or regional level. Set-asides should be defined using internationally recognized approaches or methodologies (e.g., High Conservation Value, systematic conservation planning).

- Implementing measures to minimize habitat fragmentation, such as biological corridors;
- Restoring habitats during operations and/or after operations; and
- Implementing biodiversity offsets.

Critical Habitat

16. Critical habitats are areas with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered[11] species; (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes.

17. In areas of critical habitat, the client will not implement any project activities unless all of the following are demonstrated:

- No other viable alternatives within the region exist for development of the project on modified or natural habitats that are not critical;
- The project does not lead to measurable adverse impacts on those biodiversity values for which the critical habitat was designated, and on the ecological processes supporting those biodiversity values;[12]
- The project does not lead to a net reduction in the global and/or national/regional population[13] of any Critically Endangered or Endangered species over a reasonable period of time;[14] and
- A robust, appropriately designed, and long-term biodiversity monitoring and evaluation program is integrated into the client's management program.

18. In such cases where a client is able to meet the requirements defined in paragraph 17, the project's mitigation strategy will be described in a Biodiversity Action Plan and will be designed to achieve net gains[15] of those biodiversity values for which the critical habitat was designated.

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[11] As listed on the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species. The determination of critical habitat based on other listings is as follows: (i) If the species is listed nationally / regionally as critically endangered or endangered, in countries that have adhered to IUCN guidance, the critical habitat determination will be made on a project by project basis in consultation with competent professionals; and (ii) in instances where nationally or regionally listed species' categorizations do not correspond well to those of the IUCN (e.g., some countries more generally list species as "protected" or "restricted"), an assessment will be conducted to determine the rationale and purpose of the listing. In this case, the critical habitat determination will be based on such an assessment.

[12] Biodiversity values and their supporting ecological processes will be determined on an ecologically relevant scale.

[13] Net reduction is a singular or cumulative loss of individuals that impacts on the species' ability to persist at the global and/or regional/national scales for many generations or over a long period of time. The scale (i.e., global and/or regional/national) of the potential net reduction is determined based on the species' listing on either the (global) IUCN Red List and/or on regional/national lists. For species listed on both the (global) IUCN Red List and the national/regional lists, the net reduction will be based on the national/regional population.

[14] The timeframe in which clients must demonstrate "no net reduction" of Critically Endangered and Endangered species will be determined on a case-by-case basis in consultation with external experts.

[15] Net gains are additional conservation outcomes that can be achieved for the biodiversity values for which the critical habitat was designated. Net gains may be achieved through the development of a biodiversity offset and/or, in instances where the client could meet the requirements of paragraph 17 of this Performance Standard without a biodiversity offset, the client should achieve net gains through the implementation of programs that could be implemented in situ (on-the-ground) to enhance habitat, and protect and conserve biodiversity.

19. In instances where biodiversity offsets are proposed as part of the mitigation strategy, the client must demonstrate through an assessment that the project's significant residual impacts on biodiversity will be adequately mitigated to meet the requirements of paragraph 17.

Legally Protected and Internationally Recognized Areas

20. In circumstances where a proposed project is located within a legally protected area[16] or an internationally recognized area,[17] the client will meet the requirements of paragraphs 13 through 19 of this Performance Standard, as applicable. In addition, the client will:

- Demonstrate that the proposed development in such areas is legally permitted;
- Act in a manner consistent with any government recognized management plans for such areas;
- Consult protected area sponsors and managers, Affected Communities, Indigenous Peoples and other stakeholders on the proposed project, as appropriate; and
- Implement additional programs, as appropriate, to promote and enhance the conservation aims and effective management of the area.[18]

Invasive Alien Species

21. Intentional or accidental introduction of alien, or non-native, species of flora and fauna into areas where they are not normally found can be a significant threat to biodiversity, since some alien species can become invasive, spreading rapidly and out-competing native species.

22. The client will not intentionally introduce any new alien species (not currently established in the country or region of the project) unless this is carried out in accordance with the existing regulatory framework for such introduction. Notwithstanding the above, the client will not deliberately introduce any alien species with a high risk of invasive behavior regardless of whether such introductions are permitted under the existing regulatory framework. All introductions of alien species will be subject to a risk assessment (as part of the client's environmental and social risks and impacts identification process) to determine the potential for invasive behavior. The client will implement measures to avoid the potential for accidental or unintended introductions including the transportation of substrates and vectors (such as soil, ballast, and plant materials) that may harbor alien species.

23. Where alien species are already established in the country or region of the proposed project, the client will exercise diligence in not spreading them into areas in which they have not already been established. As practicable, the client should take measures to eradicate such species from the natural habitats over which they have management control.

Management of Ecosystem Services

24. Where a project is likely to adversely impact ecosystem services, as determined by the risks and impacts identification process, the client will conduct a systematic review to identify priority

[16] This Performance Standard recognizes legally protected areas that meet the IUCN definition: "A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values." For the purposes of this Performance Standard, this includes areas proposed by governments for such designation.

[17] Exclusively defined as UNESCO Natural World Heritage Sites, UNESCO Man and the Biosphere Reserves, Key Biodiversity Areas, and wetlands designated under the Convention on Wetlands of International Importance (the Ramsar Convention).

[18] Implementing additional programs may not be necessary for projects that do not create a new footprint.

ecosystem services. Priority ecosystem services are two-fold: (i) those services on which project operations are most likely to have an impact and, therefore, which result in adverse impacts to Affected Communities; and/or (ii) those services on which the project is directly dependent for its operations (e.g., water). When Affected Communities are likely to be impacted, they should participate in the determination of priority ecosystem services in accordance with the stakeholder engagement process as defined in Performance Standard 1.

25. With respect to impacts on priority ecosystem services of relevance to Affected Communities and where the client has direct management control or significant influence over such ecosystem services, adverse impacts should be avoided. If these impacts are unavoidable, the client will minimize them and implement mitigation measures that aim to maintain the value and functionality of priority services. With respect to impacts on priority ecosystem services on which the project depends, clients should minimize impacts on ecosystem services and implement measures that increase resource efficiency of their operations, as described in Performance Standard 3. Additional provisions for ecosystem services are included in Performance Standards 4, 5, 7, and 8.[19]

Sustainable Management of Living Natural Resources

26. Clients who are engaged in the primary production of living natural resources, including natural and plantation forestry, agriculture, animal husbandry, aquaculture, and fisheries, will be subject to the requirements of paragraphs 26 through 30, in addition to the rest of this Performance Standard. Where feasible, the client will locate land-based agribusiness and forestry projects on unforested land or land already converted. Clients who are engaged in such industries will manage living natural resources in a sustainable manner, through the application of industry-specific good management practices and available technologies. Where such primary production practices are codified in globally, regionally, or nationally recognized standards, the client will implement sustainable management practices to one or more relevant and credible standards as demonstrated by independent verification or certification.

27. Credible globally, regionally, or nationally recognized standards for sustainable management of living natural resources are those which (i) are objective and achievable; (ii) are founded on a multi-stakeholder consultative process; (iii) encourage step-wise and continual improvements; and (iv) provide for independent verification or certification through appropriate accredited bodies for such standards.[20]

28. Where relevant and credible standard(s) exist, but the client has not yet obtained independent verification or certification to such standard(s), the client will conduct a pre-assessment of its conformity to the applicable standard(s) and take actions to achieve such verification or certification over an appropriate period of time.

29. In the absence of a relevant and credible global, regional, or national standard for the particular living natural resource in the country concerned, the client will:

[19] Ecosystem service references are located in Performance Standard 4, paragraph 8; Performance Standard 5, paragraphs 5 and 25–29; Performance Standard 7, paragraphs 13–17 and 20; and Performance Standard 8, paragraph 11.

[20] A credible certification system would be one which is independent, cost-effective, based on objective and measurable performance standards and developed through consultation with relevant stakeholders, such as local people and communities, Indigenous Peoples, and civil society organizations representing consumer, producer and conservation interests. Such a system has fair, transparent and independent decision-making procedures that avoid conflicts of interest.

- Commit to applying good international industry operating principles, management practices, and technologies; and
- Actively engage and support the development of a national standard, where relevant, including studies that contribute to the definition and demonstration of sustainable practices.

Supply Chain

30. Where a client is purchasing primary production (especially but not exclusively food and fiber commodities) that is known to be produced in regions where there is a risk of significant conversion of natural and/or critical habitats, systems and verification practices will be adopted as part of the client's ESMS to evaluate its primary suppliers.[21] The systems and verification practices will (i) identify where the supply is coming from and the habitat type of this area; (ii) provide for an ongoing review of the client's primary supply chains; (iii) limit procurement to those suppliers that can demonstrate that they are not contributing to significant conversion of natural and/or critical habitats (this may be demonstrated by delivery of certified product, or progress towards verification or certification under a credible scheme in certain commodities and/or locations); and (iv) where possible, require actions to shift the client's primary supply chain over time to suppliers that can demonstrate that they are not significantly adversely impacting these areas. The ability of the client to fully address these risks will depend upon the client's level of management control or influence over its primary suppliers.

[21] Primary suppliers are those suppliers who, on an ongoing basis, provide the majority of living natural resources, goods, and materials essential for the core business processes of the project.

Performance Standard 7
Indigenous Peoples

January 1, 2012

Introduction

1. Performance Standard 7 recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social, and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development. Indigenous Peoples are particularly vulnerable if their lands and resources are transformed, encroached upon, or significantly degraded. Their languages, cultures, religions, spiritual beliefs, and institutions may also come under threat. As a consequence, Indigenous Peoples may be more vulnerable to the adverse impacts associated with project development than non-indigenous communities. This vulnerability may include loss of identity, culture, and natural resource-based livelihoods, as well as exposure to impoverishment and diseases.

2. Private sector projects can create opportunities for Indigenous Peoples to participate in, and benefit from project-related activities that may help them fulfill their aspiration for economic and social development. Furthermore, Indigenous Peoples may play a role in sustainable development by promoting and managing activities and enterprises as partners in development. Government often plays a central role in the management of Indigenous Peoples' issues, and clients should collaborate with the responsible authorities in managing the risks and impacts of their activities.[1]

Objectives

- To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples.
- To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts.
- To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner.
- To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project's life-cycle.
- To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present.
- To respect and preserve the culture, knowledge, and practices of Indigenous Peoples.

Scope of Application

3. The applicability of this Performance Standard is established during the environmental and social risks and impacts identification process. The implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the client's Environmental and Social Management System, the elements of which are outlined in Performance Standard 1.

[1] In addition to meeting the requirements under this Performance Standard, clients must comply with applicable national law, including those laws implementing host country obligations under international law.

4. There is no universally accepted definition of "Indigenous Peoples." Indigenous Peoples may be referred to in different countries by such terms as "Indigenous ethnic minorities," "aboriginals," "hill tribes," "minority nationalities," "scheduled tribes," "first nations," or "tribal groups."

5. In this Performance Standard, the term "Indigenous Peoples" is used in a generic sense to refer to a distinct social and cultural group possessing the following characteristics in varying degrees:

- Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others;
- Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories;
- Customary cultural, economic, social, or political institutions that are separate from those of the mainstream society or culture; or
- A distinct language or dialect, often different from the official language or languages of the country or region in which they reside.

6. This Performance Standard applies to communities or groups of Indigenous Peoples who maintain a collective attachment, i.e., whose identity as a group or community is linked, to distinct habitats or ancestral territories and the natural resources therein. It may also apply to communities or groups that have lost collective attachment to distinct habitats or ancestral territories in the project area, occurring within the concerned group members' lifetime, because of forced severance, conflict, government resettlement programs, dispossession of their lands, natural disasters, or incorporation of such territories into an urban area.

7. The client may be required to seek inputs from competent professionals to ascertain whether a particular group is considered as Indigenous Peoples for the purpose of this Performance Standard.

Requirements

General

Avoidance of Adverse Impacts

8. The client will identify, through an environmental and social risks and impacts assessment process, all communities of Indigenous Peoples within the project area of influence who may be affected by the project, as well as the nature and degree of the expected direct and indirect economic, social, cultural (including cultural heritage[2]), and environmental impacts on them.

9. Adverse impacts on Affected Communities of Indigenous Peoples should be avoided where possible. Where alternatives have been explored and adverse impacts are unavoidable, the client will minimize, restore, and/or compensate for these impacts in a culturally appropriate manner commensurate with the nature and scale of such impacts and the vulnerability of the Affected Communities of Indigenous Peoples. The client's proposed actions will be developed with the ICP of the Affected Communities of Indigenous Peoples and contained in a time-bound plan, such as an Indigenous Peoples Plan, or a broader community development plan with separate components for Indigenous Peoples.[3]

[2] Additional requirements on protection of cultural heritage are set out in Performance Standard 8.

[3] The determination of the appropriate plan may require the input of competent professionals. A community development plan may be appropriate in circumstances where Indigenous Peoples are a part of larger Affected Communities.

Participation and Consent

10. The client will undertake an engagement process with the Affected Communities of Indigenous Peoples as required in Performance Standard 1. This engagement process includes stakeholder analysis and engagement planning, disclosure of information, consultation, and participation, in a culturally appropriate manner. In addition, this process will:

- Involve Indigenous Peoples' representative bodies and organizations (e.g., councils of elders or village councils), as well as members of the Affected Communities of Indigenous Peoples; and
- Provide sufficient time for Indigenous Peoples' decision-making processes.[4]

11. Affected Communities of Indigenous Peoples may be particularly vulnerable to the loss of, alienation from or exploitation of their land and access to natural and cultural resources.[5] In recognition of this vulnerability, in addition to the General Requirements of this Performance Standard, the client will obtain the FPIC of the Affected Communities of Indigenous Peoples in the circumstances described in paragraphs 13–17 of this Performance Standard. FPIC applies to project design, implementation, and expected outcomes related to impacts affecting the communities of Indigenous Peoples. When any of these circumstances apply, the client will engage external experts to assist in the identification of the project risks and impacts.

12. There is no universally accepted definition of FPIC. For the purposes of Performance Standards 1, 7 and 8, "FPIC" has the meaning described in this paragraph. FPIC builds on and expands the process of ICP described in Performance Standard 1 and will be established through good faith negotiation between the client and the Affected Communities of Indigenous Peoples. The client will document: (i) the mutually accepted process between the client and Affected Communities of Indigenous Peoples, and (ii) evidence of agreement between the parties as the outcome of the negotiations. FPIC does not necessarily require unanimity and may be achieved even when individuals or groups within the community explicitly disagree.

Circumstances Requiring Free, Prior, and Informed Consent

Impacts on Lands and Natural Resources Subject to Traditional Ownership or Under Customary Use

13. Indigenous Peoples are often closely tied to their lands and related natural resources.[6] Frequently, these lands are traditionally owned or under customary use.[7] While Indigenous Peoples may not possess legal title to these lands as defined by national law, their use of these lands, including seasonal or cyclical use, for their livelihoods, or cultural, ceremonial, and spiritual purposes that define their identity and community, can often be substantiated and documented.

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4 Internal decision making processes are generally but not always collective in nature. There may be internal dissent, and decisions may be challenged by some in the community. The consultation process should be sensitive to such dynamics and allow sufficient time for internal decision making processes to reach conclusions that are considered legitimate by the majority of the concerned participants.

5 Natural resources and natural areas with cultural value referred to in this Performance Standard are equivalent to ecosystem provisioning and cultural services as described in Performance Standard 6.

6 Examples include marine and aquatic resources timber, and non-timber forest products, medicinal plants, hunting and gathering grounds, and grazing and cropping areas. Natural resource assets, as referred to in this Performance Standard, are equivalent to provisioning ecosystem services as described in Performance Standard 6.

7 The acquisition and/or leasing of lands with legal title is addressed in Performance Standard 5: Land Acquisition and Involuntary Resettlement.

14. If the client proposes to locate a project on, or commercially develop natural resources on lands traditionally owned by, or under the customary use of, Indigenous Peoples, and adverse impacts[8] can be expected, the client will take the following steps:

- Document efforts to avoid and otherwise minimize the area of land proposed for the project;
- Document efforts to avoid and otherwise minimize impacts on natural resources and natural areas of importance[9] to Indigenous People;
- Identify and review all property interests and traditional resource uses prior to purchasing or leasing land;
- Assess and document the Affected Communities of Indigenous Peoples' resource use without prejudicing any Indigenous Peoples' land claim.[10] The assessment of land and natural resource use should be gender inclusive and specifically consider women's role in the management and use of these resources;
- Ensure that Affected Communities of Indigenous Peoples are informed of their land rights under national law, including any national law recognizing customary use rights; and
- Offer Affected Communities of Indigenous Peoples compensation and due process in the case of commercial development of their land and natural resources, together with culturally appropriate sustainable development opportunities, including:
  - Providing land-based compensation or compensation-in-kind in lieu of cash compensation where feasible.[11]
  - Ensuring continued access to natural resources, identifying the equivalent replacement resources, or, as a last option, providing compensation and identifying alternative livelihoods if project development results in the loss of access to and the loss of natural resources independent of project land acquisition.
  - Ensuring fair and equitable sharing of benefits associated with project usage of the resources where the client intends to utilize natural resources that are central to the identity and livelihood of Affected Communities of Indigenous People and their usage thereof exacerbates livelihood risk.
  - Providing Affected Communities of Indigenous Peoples with access, usage, and transit on land it is developing subject to overriding health, safety, and security considerations.

Relocation of Indigenous Peoples from Lands and Natural Resources Subject to Traditional Ownership or Under Customary Use

15. The client will consider feasible alternative project designs to avoid the relocation of Indigenous Peoples from communally held[12] lands and natural resources subject to traditional ownership or

[8] Such adverse impacts may include impacts from loss of access to assets or resources or restrictions on land use resulting from project activities.

[9] "Natural resources and natural areas of importance" as referred to in this Performance Standard are equivalent to priority ecosystem services as defined in Performance Standard 6. They refer to those services over which the client has direct management control or significant influence, and those services most likely to be sources of risk in terms of impacts on Affected Communities of Indigenous Peoples.

[10] While this Performance Standard requires substantiation and documentation of the use of such land, clients should also be aware that the land may already be under alternative use, as designated by the host government.

[11] If circumstances prevent the client from offering suitable replacement land, the client must provide verification that such is the case. Under such circumstances, the client will provide non land-based income-earning opportunities over and above cash compensation to the Affected Communities of Indigenous Peoples.

under customary use. If such relocation is unavoidable the client will not proceed with the project unless FPIC has been obtained as described above. Any relocation of Indigenous Peoples will be consistent with the requirements of Performance Standard 5. Where feasible, the relocated Indigenous Peoples should be able to return to their traditional or customary lands, should the cause of their relocation cease to exist.

Critical Cultural Heritage

16. Where a project may significantly impact on critical cultural heritage[13] that is essential to the identity and/or cultural, ceremonial, or spiritual aspects of Indigenous Peoples lives, priority will be given to the avoidance of such impacts. Where significant project impacts on critical cultural heritage are unavoidable, the client will obtain the FPIC of the Affected Communities of Indigenous Peoples.

17. Where a project proposes to use the cultural heritage including knowledge, innovations, or practices of Indigenous Peoples for commercial purposes, the client will inform the Affected Communities of Indigenous Peoples of (i) their rights under national law; (ii) the scope and nature of the proposed commercial development; (iii) the potential consequences of such development; and (iv) obtain their FPIC. The client will also ensure fair and equitable sharing of benefits from commercialization of such knowledge, innovation, or practice, consistent with the customs and traditions of the Indigenous Peoples.

Mitigation and Development Benefits

18. The client and the Affected Communities of Indigenous Peoples will identify mitigation measures in alignment with the mitigation hierarchy described in Performance Standard 1 as well as opportunities for culturally appropriate and sustainable development benefits. The client will ensure the timely and equitable delivery of agreed measures to the Affected Communities of Indigenous Peoples.

19. The determination, delivery, and distribution of compensation and other benefit sharing measures to the Affected Communities of Indigenous Peoples will take account of the laws, institutions, and customs of these communities as well as their level of interaction with mainstream society. Eligibility for compensation can either be individually or collectively-based, or be a combination of both.[14] Where compensation occurs on a collective basis, mechanisms that promote the effective delivery and distribution of compensation to all eligible members of the group will be defined and implemented.

20. Various factors including, but not limited to, the nature of the project, the project context and the vulnerability of the Affected Communities of Indigenous Peoples will determine how these communities should benefit from the project. Identified opportunities should aim to address the goals

[12] Typically, Indigenous Peoples claim rights and access to, and use of land and resources through traditional or customary systems, many of which entail communal property rights. These traditional claims to land and resources may not be recognized under national laws. Where members of the Affected Communities of Indigenous Peoples individually hold legal title, or where the relevant national law recognizes customary rights for individuals, the requirements of Performance Standard 5 will apply, rather than the requirements under paragraph 17 of this Performance Standard.

[13] Includes natural areas with cultural and/or spiritual value such as sacred groves, sacred bodies of water and waterways, sacred trees, and sacred rocks. Natural areas with cultural value are equivalent to priority ecosystem cultural services as defined in Performance Standard 6.

[14] Where control of resources, assets and decision making are predominantly collective in nature, efforts will be made to ensure that, where possible, benefits and compensation are collective, and take account of intergenerational differences and needs.

and preferences of the Indigenous Peoples including improving their standard of living and livelihoods in a culturally appropriate manner, and to foster the long-term sustainability of the natural resources on which they depend.

Private Sector Responsibilities Where Government is Responsible for Managing Indigenous Peoples Issues

21. Where the government has a defined role in the management of Indigenous Peoples issues in relation to the project, the client will collaborate with the responsible government agency, to the extent feasible and permitted by the agency, to achieve outcomes that are consistent with the objectives of this Performance Standard. In addition, where government capacity is limited, the client will play an active role during planning, implementation, and monitoring of activities to the extent permitted by the agency.

22. The client will prepare a plan that, together with the documents prepared by the responsible government agency, will address the relevant requirements of this Performance Standard. The client may need to include (i) the plan, implementation, and documentation of the process of ICP and engagement and FPIC where relevant; (ii) a description of the government-provided entitlements of affected Indigenous Peoples; (iii) the measures proposed to bridge any gaps between such entitlements, and the requirements of this Performance Standard; and (iv) the financial and implementation responsibilities of the government agency and/or the client.

Performance Standard 8
Cultural Heritage

January 1, 2012

Introduction

1. Performance Standard 8 recognizes the importance of cultural heritage for current and future generations. Consistent with the Convention Concerning the Protection of the World Cultural and Natural Heritage, this Performance Standard aims to ensure that clients protect cultural heritage in the course of their project activities. In addition, the requirements of this Performance Standard on a project's use of cultural heritage are based in part on standards set by the Convention on Biological Diversity.

Objectives

- To protect cultural heritage from the adverse impacts of project activities and support its preservation.
- To promote the equitable sharing of benefits from the use of cultural heritage.

Scope of Application

2. The applicability of this Performance Standard is established during the environmental and social risks and impacts identification process. The implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the client's Environmental and Social Management System (ESMS), the elements of which are outlined in Performance Standard 1. During the project life-cycle, the client will consider potential project impacts to cultural heritage and will apply the provisions of this Performance Standard.

3. For the purposes of this Performance Standard, cultural heritage refers to (i) tangible forms of cultural heritage, such as tangible moveable or immovable objects, property, sites, structures, or groups of structures, having archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values; (ii) unique natural features or tangible objects that embody cultural values, such as sacred groves, rocks, lakes, and waterfalls; and (iii) certain instances of intangible forms of culture that are proposed to be used for commercial purposes, such as cultural knowledge, innovations, and practices of communities embodying traditional lifestyles.

4. Requirements with respect to tangible forms of cultural heritage are contained in paragraphs 6–16. For requirements with respect to specific instances of intangible forms of cultural heritage described in paragraph 3 (iii) see paragraph 16.

5. The requirements of this Performance Standard apply to cultural heritage regardless of whether or not it has been legally protected or previously disturbed. The requirements of this Performance Standard do not apply to cultural heritage of Indigenous Peoples; Performance Standard 7 describes those requirements.

Requirements

Protection of Cultural Heritage in Project Design and Execution

6. In addition to complying with applicable law on the protection of cultural heritage, including national law implementing the host country's obligations under the Convention Concerning the Protection of the World Cultural and Natural Heritage, the client will identify and protect cultural heritage by ensuring that internationally recognized practices for the protection, field-based study, and documentation of cultural heritage are implemented.

7. Where the risk and identification process determines that there is a chance of impacts to cultural heritage, the client will retain competent professionals to assist in the identification and protection of cultural heritage. The removal of nonreplicable cultural heritage is subject to the additional requirements of paragraph 10 below. In the case of critical cultural heritage, the requirements of paragraphs 13–15 will apply.

Chance Find Procedures

8. The client is responsible for siting and designing a project to avoid significant adverse impacts to cultural heritage. The environmental and social risks and impacts identification process should determine whether the proposed location of a project is in areas where cultural heritage is expected to be found, either during construction or operations. In such cases, as part of the client's ESMS, the client will develop provisions for managing chance finds[1] through a chance find procedure[2] which will be applied in the event that cultural heritage is subsequently discovered. The client will not disturb any chance find further until an assessment by competent professionals is made and actions consistent with the requirements of this Performance Standard are identified.

Consultation

9. Where a project may affect cultural heritage, the client will consult with Affected Communities within the host country who use, or have used within living memory, the cultural heritage for long-standing cultural purposes. The client will consult with the Affected Communities to identify cultural heritage of importance, and to incorporate into the client's decision-making process the views of the Affected Communities on such cultural heritage. Consultation will also involve the relevant national or local regulatory agencies that are entrusted with the protection of cultural heritage.

Community Access

10. Where the client's project site contains cultural heritage or prevents access to previously accessible cultural heritage sites being used by, or that have been used by, Affected Communities within living memory for long-standing cultural purposes, the client will, based on consultations under paragraph 9, allow continued access to the cultural site or will provide an alternative access route, subject to overriding health, safety, and security considerations.

Removal of Replicable Cultural Heritage

11. Where the client has encountered tangible cultural heritage that is replicable[3] and not critical, the client will apply mitigation measures that favor avoidance. Where avoidance is not feasible, the client will apply a mitigation hierarchy as follows:

- Minimize adverse impacts and implement restoration measures, in situ, that ensure maintenance of the value and functionality of the cultural heritage, including maintaining or restoring any ecosystem processes[4] needed to support it;
- Where restoration in situ is not possible, restore the functionality of the cultural heritage, in a different location, including the ecosystem processes needed to support it;

[1] Tangible cultural heritage encountered unexpectedly during project construction or operation.

[2] A chance find procedure is a project-specific procedure that outlines the actions to be taken if previously unknown cultural heritage is encountered.

[3] Replicable cultural heritage is defined as tangible forms of cultural heritage that can themselves be moved to another location or that can be replaced by a similar structure or natural features to which the cultural values can be transferred by appropriate measures. Archeological or historical sites may be considered replicable where the particular eras and cultural values they represent are well represented by other sites and/or structures.

[4] Consistent with requirements in Performance Standard 6 related to ecosystem services and conservation of biodiversity.

- The permanent removal of historical and archeological artifacts and structures is carried out according to the principles of paragraphs 6 and 7 above; and
- Only where minimization of adverse impacts and restoration to ensure maintenance of the value and functionality of the cultural heritage are demonstrably not feasible, and where the Affected Communities are using the tangible cultural heritage for long-standing cultural purposes, compensate for loss of that tangible cultural heritage.

Removal of Non-Replicable Cultural Heritage

12. Most cultural heritage is best protected by preservation in its place, since removal is likely to result in irreparable damage or destruction of the cultural heritage. The client will not remove any nonreplicable cultural heritage,[5] unless all of the following conditions are met:

- There are no technically or financially feasible alternatives to removal;
- The overall benefits of the project conclusively outweigh the anticipated cultural heritage loss from removal; and
- Any removal of cultural heritage is conducted using the best available technique.

Critical Cultural Heritage

13. Critical cultural heritage consists of one or both of the following types of cultural heritage: (i) the internationally recognized heritage of communities who use, or have used within living memory the cultural heritage for long-standing cultural purposes; or (ii) legally protected cultural heritage areas, including those proposed by host governments for such designation.

14. The client should not remove, significantly alter, or damage critical cultural heritage. In exceptional circumstances when impacts on critical cultural heritage are unavoidable, the client will use a process of Informed Consultation and Participation (ICP) of the Affected Communities as described in Performance Standard 1 and which uses a good faith negotiation process that results in a documented outcome. The client will retain external experts to assist in the assessment and protection of critical cultural heritage.

15. Legally protected cultural heritage areas[6] are important for the protection and conservation of cultural heritage, and additional measures are needed for any projects that would be permitted under the applicable national law in these areas. In circumstances where a proposed project is located within a legally protected area or a legally defined buffer zone, the client, in addition to the requirements for critical cultural heritage cited in paragraph 14 above, will meet the following requirements:

- Comply with defined national or local cultural heritage regulations or the protected area management plans;
- Consult the protected area sponsors and managers, local communities and other key stakeholders on the proposed project; and
- Implement additional programs, as appropriate, to promote and enhance the conservation aims of the protected area.

[5] Nonreplicable cultural heritage may relate to the social, economic, cultural, environmental, and climatic conditions of past peoples, their evolving ecologies, adaptive strategies, and early forms of environmental management, where the (i) cultural heritage is unique or relatively unique for the period it represents, or (ii) cultural heritage is unique or relatively unique in linking several periods in the same site.

[6] Examples include world heritage sites and nationally protected areas.

Project's Use of Cultural Heritage

16. Where a project proposes to use the cultural heritage, including knowledge, innovations, or practices of local communities for commercial purposes,[7] the client will inform these communities of (i) their rights under national law; (ii) the scope and nature of the proposed commercial development; and (iii) the potential consequences of such development. The client will not proceed with such commercialization unless it (i) enters into a process of ICP as described in Performance Standard 1 and which uses a good faith negotiation process that results in a documented outcome and (ii) provides for fair and equitable sharing of benefits from commercialization of such knowledge, innovation, or practice, consistent with their customs and traditions.

[7] Examples include, but are not limited to, commercialization of traditional medicinal knowledge or other sacred or traditional technique for processing plants, fibers, or metals.

Appendix 2

Expertise of EAP and Project Team

Dr Neville Bews & Associates
SOCIAL IMPACT ASSESSORS

Curriculum Vitae Neville Bews

Dr. Neville Bews & Associates – Johannesburg, South Africa

EDUCATION

- *B.A. (Soc), University of South Africa, 1980*
- *B.A. (Soc) (Hons), University of South Africa, 1984*
- *The Henley Post Graduate Certificate in Management, Henley Management College, United Kingdom*
- *M.A. (Cum Laude), Rand Afrikaans University, 1999*
- *D. Litt. et Phil., Rand Afrikaans University, 2000*

Dr Neville Bews is a senior social scientist and human resource professional with 38 years' experience. He consults in the fields of Social Impact Assessments and research, and human resource management. He has worked on a number of large infrastructure, mining and water resource projects. He at times lectures on social impact assessment for the Department of Sociology, University of Johannesburg.

EXPERIENCE – EXAMPLES

Water resources and regional planning Social Impact Assessments

Department of Water Affairs and Forestry **South Africa**

Social impact assessment for the Mokolo and Crocodile River (West) Water Augmentation Project for increased and assurance of water supply. Research socio-economic circumstances, data analysis, assessment, authored report.

Mzimvubu Water Project Eastern Cape. Research socio-economic circumstances, data analysis, assessment, authored report. Umkhomazi Water Project Phase 1 – Raw Water Component Smithfield Dam - 14/12/16/3/3/3/94; Water Conveyance Infrastructure - 14/12/16/3/3/3/94/1; Balancing Dam - 14/12/16/3/3/3/94/2.

Umkhomazi Water Project Phases 1 – Raw Water Components
Smithfield Dam – 14/12/16/3/3/3/94/
Water Conveyance Infrastructure – 14/12/16/3/3/3/94/1
Balancing Dam – 14/12/16/3/3/3/94/2

Umkhomazi Water Project Phases 2 – Potable Water Component – 14/12/16/3/3/3/95.

The Aveng (Africa) Group Limited (Grinaker LTA) **South Africa**
Assisting the construction company with the social management of the Mokolo and Crocodile River (West) Water Augmentation Project. Consult and mediate between contractors and affected parties advise on strategies to reduce tensions between contractors and the public.

Sedibeng District Municipality **South Africa**
Social impact assessment for the Environmental Management Plan for the Sedibeng District, on behalf of Felehetsa Environmental (Pty) Ltd. Research socio-economic circumstances, data analysis, assessment, authored report.

Felehetsa Environmental (Pty) Ltd **South Africa**
Social Impact Assessment for Waterfall Wedge housing and business development situated in Midrand Gauteng. Research socio-economic circumstances, data analysis, assessment, authored report.

NEMAI Consulting Environmental & Social Consultants **South Africa**
Ncwabeni: Off-Channel Storage Dam, KwaZulu-Natal. Research socio-economic circumstances, data analysis, assessment, authored report.

Social Assessments for mining clients

Vale **Mozambique**
Socio-economic impact assessment of proposed Moatize power plant, Tete. Research socio-economic circumstances, data analysis, assessment, authored report.

Exxaro Resources Limited **South Africa**
Social impact assessment for the social and labour plan for Leeuwpan Coal Mine, Delmas. Research socio-economic circumstances, data analysis, assessment, authored report.

Social impact assessment for the social and labour plan for Glen Douglas Dolomite Mine, Henley-on-Klip. Research socio-economic circumstances, data analysis, assessment, authored report.

Social impact assessment for the social and labour plan for Grootegeluk Open Cast Coal Mine, Lephalale. Research socio-economic circumstances, data analysis, assessment, authored report.

Social and labour plan for the Paardekraal Project, Belfast. Research socio-economic circumstances, data analysis, assessment, authored report.

Social impact assessment for the Paardekraal Belfast Project Belfast. Research socio-economic circumstances, data analysis, assessment, authored report.

Kumba Resources Ltd **South Africa**

Social Impact Assessments for the Sishen Iron Ore Mine in Kathu Northern Cape. Research socio-economic circumstances, data analysis, assessment, authored report.

Social Impact Assessments for the Sishen South Project in Postmasburg, Northern Cape. Research socio-economic circumstances, data analysis, assessment, authored report.

Social Impact Assessments for the Dingleton resettlement project at Sishen Iron Ore Mine Kathu, Northern Cape. Research socio-economic circumstances, data analysis, assessment, authored report.

Gold Fields **South Africa**

Social Impact Assessment for the Gold Fields West Wits Project. Research socio-economic circumstances, data analysis, assessment, authored report.

Anglo Coal **South Africa**

Review of social impact assessment for the proposed Waterberg Gas 37-spot coalbed methane (CBM) bulk yield test project.

Sekoko Mining **South Africa**

Sekoko Wayland Iron Ore, Molemole Local Municipalities in Limpopo Province. Research socio-economic circumstances, data analysis, assessment, authored report.

Memor Mining (Pty) Ltd **South Africa**

Langpan Chrome Mine, Thabazimbi, Limpopo. Research socio-economic circumstances, data analysis, assessment, authored report.

Prescali Environmental Consultants (Pty) Ltd **South Africa**

Vlakpoort Open Cast Mine – Thabazimbi, Limpopo. Research socio-economic circumstances, data analysis, assessment, authored report.

Afrimat Ltd **South Africa**

1. Marble Hall Lime Burning Project: Social Impact Assessment – Limpopo.
2. Glen Douglas Lime Burning Project: Social Impact Assessment - Henley-on Klip, Midvaal

Social assessments for regional and linear projects

Gautrans **South Africa**

Social impact for the Gautrain Rapid Rail Link, Pretoria to Johannesburg and Kempton Park. Managed a team of 10 field workers, research socio-economic circumstances, data analysis, assessment, and co-authored report.

South African National Road Agency Limited **South Africa**

Social Impact of tolling the Gauteng Freeway Improvement Project. Research socio-economic circumstances, data analysis, assessment, authored report.

Social Impact of the N2 Wild Coast Toll Highway. Managed a team of three specialists. Research socio-economic circumstances, data analysis, assessment, co-authored report.

SIA for the N3 Keeversfontein to Warden (De Beers Pass Section). Research socio-economic circumstances, data analysis, assessment, authored report.

Transnet **South Africa**

Social impact assessment for the Transnet New Multi-Product Pipeline Project (555 km) (Commercial Farmers). Research socio-economic circumstances, data analysis, assessment, authored report.

Expansion of Railway Loops at Arthursview; Paul; Phokeng and Rooiheuwel Sidings in the Bojanala Platinum District Municipality in the North West Province for Transnet Soc Ltd.

Eskom Holdings Limited **South Africa**

Social Impact Assessment for the Ubertas 88/11kV Substation in Sandton, Johannesburg. Research socio-economic circumstances, data analysis, assessment, authored report.

Nuclear 1 Power Plant. Assisted with the social impact assessment consulting to Arcus GIBB Engineering & Science. Peer review and adjusted the report and assisted at the public participation feedback meetings.

Social impact assessment for Eskom Holdings Limited, Transmission Division's Neptune-Poseidon 400kV Power Line in the Eastern Cape. Research socio-economic circumstances, data analysis, assessment, authored report.

Social Impact assessment for Eskom Holdings Limited, Transmission Division, Forskor-Mernsky 275kV±130km Powerline and Associated Substation Works in Limpopo Province. Research socio-economic circumstances, data analysis, assessment, authored report.

Eskom Holdings Limited, Transmission Division **South Africa**
Social Impact assessment for Eskom Holdings Limited, Transmission Division, Tubatse Strengthening Phase 1 – Senakangwedi B Integration in Limpopo Province. Research socio-economic circumstances, data analysis, assessment, authored report.

Basic SIA study for Proposed 1 X 400 kV Eskom Maphutha - Witkop 170 km Powerline.

Social Impact Assessment for the Mulalo Main Transmission Substation and Power Line Integration Project, Secunda

MGTD Environmental **South Africa**
Social impact assessment for a 150MW Photovoltaic Power Plant and Associated Infrastructure in Mpumalanga. Research socio-economic circumstances, data analysis, assessment, authored report.

10MWp Photovoltaic Power Plant & Associated Infrastructure, North West Province. Research socio-economic circumstances, data analysis, assessment, authored report.

eThekwini Municipality **South Africa**
Social impact assessment for the proposed infilling of the Model Yacht Pond at Blue Lagoon, Stiebel Place, Durban. Research socio-economic circumstances, data analysis, assessment, authored report.

Kennedy Road Housing Project, Ward 25 situated on 316 Kennedy Road, Clare Hills (Erf 301, Portion 5).

Afzelia Environmental Consultants and Environmental Planning & Design **South Africa**
Proposed Cato Ridge Crematorium In Kwazulu-Natal Province

MGTD Environmental **South Africa**
ABC Prieska Solar Project; Proposed 75 MWp Photovoltaic Power Plant and its associated infrastructure on a portion of the remaining extent of ERF 1 Prieska, Northern Cape. Research socio-economic circumstances, data analysis, assessment, authored report.

ABC Prieska Solar Project; Proposed 75 MWp Photovoltaic Power Plant and its associated infrastructure on a portion of the remaining extent of ERF 1 Prieska, Northern Cape.

Assessments for social projects and social research

Australia – Africa 2006 Sport Development Program **South Africa**
To establish and assess the impact of the Active Community Clubs Initiative on the communities of NU2 (in the township of Mdantsane)*and Tshabo (a rural village). Lead researcher social, data collection and analysis, assessment.

United Nations Office on Drugs and Crime **South Africa**
Evaluation of a Centre for Violence Against Women in Upington. Research socio-economic circumstances, data analysis, assessment, co-authored report.

University of Johannesburg **South Africa**
Research into research outputs of academics working in the various departments of the university. Research socio-economic circumstances, data analysis, assessment, authored report.

Human Resource and management training

Various national companied **South Africa**
Developed and run various management courses such as, recruitment selection & placement; industrial relations / disciplinary hearings; team building workshops; multiculturalism workshop. 1986-2007

University of South Africa, Department of Industrial Psychology **South Africa**
Developed the performance development study guide for industrial psychology 3. 2000

Authored Chapters in HR books **South Africa**
In Slabbert J.A. de Villiers, A.S. & Parker A (eds.). Managing employment relations in South Africa. Teamwork within the world-class organisation. 2005

In Muchinsky, P. M. Kriek, H. J. & Schreuder, A. M. G. Personnel Psychology 3rd Edition
Chapter 9 – Human resource planning.
Chapter 10 – The changing nature of work. 2005

In Rossouw, G. J. and van Vuuren, L. Business Ethics - Made in Africa 4th Edition.
Chapter 11 – Building Trust with Ethics. 2010

South African Management Development Institute (SAMDI) **Democratic Republic of the Congo**
Developed a course on Strategic Human Resource Planning for SAMDI and the Democratic Republic of the Congo as well as trainer's manuals for this course. 2006.

Competition Tribunal **South Africa**
Developed a Performance Management System and Policy for the Competition Tribunal South Africa. 2006

PUBLICATIONS

Bews, N. & Martins, N. 2002. An evaluation of the facilitators of trustworthiness. SA Journal of Industrial Psychology. 28(4), 14-19.

Bews, N. Martins, N. & von der Ohe, H. 2002. Editorial. SA Journal of Industrial Psychology. 28(4), 1.

Bews, N. & Rossouw, D. 2002. Contemporary organisational change and the importance of trust. SA Journal of Industrial Psychology. 28(4), 2-6.

Bews, N. & Uys, T. 2002. The impact of organisational restructuring on perceptions of trustworthiness. SA Journal of Industrial Psychology. 28(4), 21-28.

Bews, N & Rossouw, D. 2002. A role for business ethics in facilitating trustworthiness. Journal of Business Ethics. 39: 377-390.

Bews, N. 2009. A matter of trust – Gaining the confidence of the public and client. IAIA Newsletter Forthcoming (Spring 2009).

Bews, N. 2009. Does he who pays the bill call the shots? Sitting astride client and public interest – the dilemma of maintaining credibility in impact assessments. IAIA Newsletter Winter – 2009.

Bews, N. 2002. Reducing your company's risk of sexual harassment claims. HR Future. (2) 2 10-11.

Bews, N. & Martins, N. von der Ohe, H. 2002. Organisational change and trust: Experiences here and abroad. Management Today, (18) 8 34-35.

Martins, N. Bews, N. & von der Ohe, H. 2002. Organisational change and trust. Lessons from Europe and South African organisations. HR Future, (2)9 46-47.

Rossouw, D. & Bews, N. 2002. The importance of trust within a changing business environment. Management Today. 18(2) 26-27.

Bews, N. 2001. You can put a value to trust in the new economy. HR Future, (1)1 48-49.

Bews, N. 2001. Maintaining trust during organisational change. Management Today, (17) 2 36-39.

Bews, N. 2001. Business ethics, trust and leadership: how does Africa fare? Management Today, (17) 7 14-15.

Rossouw, D & Bews, N. 2001. Trust is on the decline in the workplace, yet it's vital for modern organisational success. People Dynamics. (18) 6 28-30.

Bews, N. & Uys, T. 2001. The effects of restructuring on organisational trust. HR Future, (1)8 50-52.

Rossouw, G. J. & Bews. N. F. 2010. Building Trust with Ethics. In Rossouw, G. J. and van Vuuren, L. Business Ethics - Made in Africa 4th Edition. Cape Town: Oxford University Press.

Bews N. 2005. Teamwork within the world-class organisation. In Slabbert J.A. de Villiers, A.S. & Parker A (eds.). Managing employment relations in South Africa. Durban : Butterworths.

Bews, N. F. 2005. Human resource planning. In Muchinsky, P. M. Kriek, H. J. & Schreuder, A. M. G. 2005. Personnel Psychology 3rd Edition. Cape Town; Oxford University Press.

Bews, N. F. 2005. The changing nature of work. In Muchinsky, P. M. Kriek, H. J. & Schreuder, A. M. G. 2005. Personnel Psychology 3rd Edition. Cape Town; Oxford University Press.

Bews, N. F. 2005. Chapter 9 & 13. In Muchinsky, P. M. Kriek, H. J. & Schreuder, A. M. G. 2005. Instructor's Manual. Personnel Psychology 3rd Edition. Cape Town; Oxford University Press.

Bews, N. F., Schreuder, A. M. G. & Vosloo, S. E. 2000. Performance Development. Study guide for Industrial Psychology 3. Pretoria: University of South Africa.

Uys, T. and Bews, N. 2003. ''Not in my Backyard'': Challenges in the Social Impact Assessment of the Gautrain. Department of Sociology Seminar, RAU. 23 May 2003.

Bews, N. 2002. The value of trust in the new economy. Industrial Relations Association of South Africa (Irasa). Morning seminar 21 August 2002.

Bews. N, 2002. The issue of trust considered. Knowledge Recourses seminar on Absenteeism. The Gordon Institute of Business. 27 August 2002.

Bews, N. & Uys, T. 2001. The impact of organisational trust on perceptions of trustworthiness. South African Sociological Association Conference. Pretoria.

Bews, N. 2001. Business Trust, Ethics & Leadership:- Made in Africa. International Management Today/Productivity Development Conference. Hosted by Productivity Development (Pty) Ltd & Management Today. Best Knowledge in Leadership Practice Conference 23-24 July 2001.

Bews, N. 2001. Charting new directions in leading organisational culture and climate change. Workplace Transformation and Organisational Renewal. Hosted by The Renaissance Network. November 2001.

Bews, N. 2000. Towards a model for trust. South African Sociological Association Conference. Saldanha.

Bews, N. 2003. 'Social Impact Assessments, theory and practice juxtaposed – Experience from a South African rapid rail project.' New Directions in Impact Assessment for Development: Methods and Practice Conference. University of Manchester, Manchester, England.

MEMBERSHIP OF PROFESSIONAL BODIES

Member of South African Affiliate of the International Association for Impact Assessment (IAIAsa). Membership Number: 2399

Registered on database for scientific peer review of iSimangaliso GEF project outputs

CURRICULUM VITAE

ELIZE BUTLER

PROFESSION: Palaeontologist

YEARS' EXPERIENCE: 25 years in Palaeontology

EDUCATION: B.Sc Botany and Zoology, 1988

University of the Orange Free State

B.Sc (Hons) Zoology, 1991

University of the Orange Free State

Management Course, 1991

University of the Orange Free State

M. Sc. *Cum laude* (Zoology), 2009

University of the Free State

Dissertation title: The postcranial skeleton of the Early Triassic non-mammalian Cynodont *Galesaurus planiceps*: implications for biology and lifestyle

Registered as a PhD fellow at the Zoology Department of the UFS

2013 to current

Dissertation title: A new gorgonopsian from the uppermost D*aptocephalus Assemblage Zone*, in the Karoo Basin of South Africa

MEMBERSHIP

Palaeontological Society of South Africa (PSSA)	2006-currently

EMPLOYMENT HISTORY

Part time Laboratory assistant	Department of Zoology & Entomology University of the Free State Zoology 1989-1992
Part time laboratory assistant	Department of Virology University of the Free State Zoology 1992
Research Assistant	National Museum, Bloemfontein 1993 – 1997
Principal Research Assistant and Collection Manager	National Museum, Bloemfontein 1998–currently

TECHNICAL REPORTS

Butler, E. 2014. Palaeontological Impact Assessment of the proposed development of private dwellings on portion 5 of farm 304 Matjesfontein Keurboomstrand, Knysna District, Western Cape Province. Bloemfontein.

Butler, E. 2014. Palaeontological Impact Assessment for the proposed upgrade of existing water supply infrastructure at Noupoort, Northern Cape Province. 2014. Bloemfontein.

Butler, E. 2015. Palaeontological impact assessment of the proposed consolidation, re-division and development of 250 serviced erven in Nieu-Bethesda, Camdeboo local municipality, Eastern Cape. Bloemfontein.

Butler, E. 2015. Palaeontological impact assessment of the proposed mixed land developments at Rooikraal 454, Vrede, Free State. Bloemfontein.

Butler, E. 2015. Palaeontological exemption report of the proposed truck stop development at Palmiet 585, Vrede, Free State. Bloemfontein.

Butler, E. 2015. Palaeontological impact assessment of the proposed Orange Grove 3500 residential development, Buffalo City Metropolitan Municipality East London, Eastern Cape. Bloemfontein.

Butler, E. 2015. Palaeontological Impact Assessment of the proposed Gonubie residential development, Buffalo City Metropolitan Municipality East London, Eastern Cape Province. Bloemfontein.

Butler, E. 2015. Palaeontological Impact Assessment of the proposed Ficksburg raw water pipeline. Bloemfontein.

Butler, E. 2015. Palaeontological Heritage Impact Assessment report on the establishment of the 65 mw Majuba Solar Photovoltaic facility and associated infrastructure on portion 1, 2 and 6 of the farm Witkoppies 81 HS, Mpumalanga Province. Bloemfontein.

Butler, E. 2015. Palaeontological Impact Assessment of the proposed township establishment on the remainder of portion 6 and 7 of the farm Sunnyside 2620, Bloemfontein, Mangaung metropolitan municipality, Free State, Bloemfontein.

Butler, E. 2015. Palaeontological Impact Assessment of the proposed Woodhouse 1 photovoltaic solar energy facilities and associated infrastructure on the farm Woodhouse729, near Vryburg, North West Province. Bloemfontein.

Butler, E. 2015. Palaeontological Impact Assessment of the proposed Woodhouse 2 photovoltaic solar energy facilities and associated infrastructure on the farm Woodhouse 729, near Vryburg, North West Province. Bloemfontein.

Butler, E. 2015. Palaeontological Impact Assessment of the proposed Orkney solar energy farm and associated infrastructure on the remaining extent of Portions 7 and 21 of the farm Wolvehuis 114, near Orkney, North West Province. Bloemfontein.

Butler, E. 2015. Palaeontological Impact Assessment of the proposed Spectra foods broiler houses and abattoir on the farm Maiden Manor 170 and Ashby Manor 171, Lukhanji Municipality, Queenstown, Eastern Cape Province. Bloemfontein.

Butler, E. 2016. Palaeontological Impact Assessment of the proposed construction of the 150 MW Noupoort concentrated solar power facility and associated infrastructure on portion 1 and 4 of the farm Carolus Poort 167 and the remainder of Farm 207, near Noupoort, Northern Cape. Prepared for Savannah Environmental. Bloemfontein.

Butler, E. 2016. Palaeontological Impact Assessment of the proposed Woodhouse 1 Photovoltaic Solar Energy facility and associated infrastructure on the farm Woodhouse 729, near Vryburg, North West Province. Bloemfontein.

Butler, E. 2016. Palaeontological Impact Assessment of the proposed Woodhouse 2 Photovoltaic Solar Energy facility and associated infrastructure on the farm Woodhouse 729, near Vryburg, North West Province. Bloemfontein.

Butler, E. 2016. Proposed 132kV overhead power line and switchyard station for the authorised Solis Power 1 CSP project near Upington, Northern Cape. Bloemfontein.

Butler, E. 2016. Palaeontological Impact Assessment of of the proposed Senqu Pedestrian Bridges in Ward 5 of Senqu Local Municipality, Eastern Cape Province. Bloemfontein.

Butler, E. 2016. Recommendation from further Palaeontological Studies: Proposed Construction of the Modderfontein Filling Station on Erf 28 Portion 30, Founders Hill, City Of Johannesburg, Gauteng Province. Bloemfontein.

Butler, E. 2016. Recommendation from further Palaeontological Studies: Proposed Construction of the Modikwa Filling Station on a Portion of Portion 2 of Mooihoek 255 Kt, Greater Tubatse Local Municipality, Limpopo Province. Bloemfontein.

Butler, E. 2016. Recommendation from further Palaeontological Studies: Proposed Construction of the Heidedal filling station on Erf 16603, Heidedal Extension 24, Mangaung Local Municipality, Bloemfontein, Free State Province. Bloemfontein.

Butler, E. 2016. Recommended Exemption from further Palaeontological studies: Proposed Construction of the Gunstfontein Switching Station, 132kv Overhead Power Line (Single Or Double Circuit) and ancillary infrastructure for the Gunstfontein Wind Farm Near Sutherland, Northern Cape Province. Savannaha South Africa. Bloemfontein.

Butler, E. 2016. Palaeontological Impact Assessment of the proposed Galla Hills Quarry on the remainder of the farm Roode Krantz 203, in the Lukhanji Municipality, division of Queenstown, Eastern Cape Province. Bloemfontein.

Butler, E. 2016. Chris Hani District Municipality Cluster 9 water backlog project phases 3a and 3b: Palaeontology inspection at Tsomo WTW. Bloemfontein.

Butler, E. 2016. Palaeontological Impact Assessment of the proposed construction of the 150 MW Noupoort concentrated solar power facility and associated infrastructure on portion 1 and 4 of the farm Carolus Poort 167 and the remainder of Farm 207, near Noupoort, Northern Cape. Savannaha South Africa. Bloemfontein.

Butler, E. 2016. Palaeontological Impact Assessment of the proposed upgrading of the main road MR450 (R335) from the Motherwell to Addo within the Nelson Mandela Bay Municipality and Sunday’s river valley Local Municipality, Eastern Cape Province. Bloemfontein.

Butler, E. 2016. Palaeontological Impact Assessment construction of the proposed Metals Industrial Cluster and associated infrastructure near Kuruman, Northern Cape province. Savannaha South Africa. Bloemfontein.

Butler, E. 2016. Palaeontological Impact Assessment for the proposed construction of up to a 132kv power line and associated infrastructure for the proposed Kalkaar Solar Thermal Power Plant near Kimberley, Free State and Northern Cape Provinces. PGS Heritage. Bloemfontein.

Butler, E. 2016. Palaeontological Impact Assessment of the proposed development of two burrow pits (DR02625 and DR02614) in the Enoch Mgijima Municipality, Chris Hani District, Eastern Cape..
Butler, E. 2016. Ezibeleni waste Buy-Back Centre (near Queenstown), Enoch Mgijima Local Municipality, Eastern Cape. Bloemfontein.

Butler, E. 2016. Palaeontological Impact Assessment for the proposed construction of two 5 Mw Solar Photovoltaic Power Plants on Farm Wildebeestkuil 59 and Farm Leeuwbosch 44, Leeudoringstad, North West Province. Bloemfontein.

Butler, E. 2016. Palaeontological Impact Assessment for the proposed development of four Leeuwberg Wind farms and basic assessments for the associated grid connection near Loeriesfontein, Northern Cape Province. Bloemfontein.

Butler, E. 2016. Palaeontological impact assessment for the proposed Aggeneys south prospecting right project, Northern Cape Province. Bloemfontein.

Butler, E. 2016. Palaeontological impact assessment of the proposed Motuoane Ladysmith Exploration right application, Kwazulu Natal. Bloemfontein.

Butler, E. 2016. Palaeontological impact assessment for the proposed construction of two 5 MW solar photovoltaic power plants on farm Wildebeestkuil 59 and farm Leeuwbosch 44, Leeudoringstad, North West Province. Bloemfontein.

Butler, E. 2016: Palaeontological desktop assessment of the establishment of the proposed residential and mixed use development on the remainder of portion 7 and portion 898 of the farm Knopjeslaagte 385 Ir, located near Centurion within the Tshwane Metropolitan Municipality of Gauteng Province. Bloemfontein.

Butler, E. 2017. Palaeontological impact assessment for the proposed development of a new cemetery, near Kathu, Gamagara local municipality and John Taolo Gaetsewe district municipality, Northern Cape. Bloemfontein.

Butler, E. 2017. Palaeontological Impact Assessment Of The Proposed Development Of The New Open Cast Mining Operations On The Remaining Portions Of 6, 7, 8 And 10 Of The Farm Kwaggafontein 8 In The Carolina Magisterial District, Mpumalanga Province. Bloemfontein.

Butler, E. 2017. Palaeontological Desktop Assessment for the Proposed Development of a Wastewater Treatment Works at Lanseria, Gauteng Province. Bloemfontein.

Butler, E. 2017. Palaeontological Scoping Report for the Proposed Construction of a Warehouse and Associated Infrastructure at Perseverance in Port Elizabeth, Eastern Cape Province.

Butler, E. 2017. Palaeontological Desktop Assessment for the Proposed Establishment of a Diesel Farm and a Haul Road for the Tshipi Borwa mine Near Hotazel, In the John Taolo Gaetsewe District Municipality in the Northern Cape Province. Bloemfontein.

Butler, E. 2017. Palaeontological Desktop Assessment for the Proposed Changes to Operations at the UMK Mine near Hotazel, In the John Taolo Gaetsewe District Municipality in the Northern Cape Province. Bloemfontein.

Butler, E. 2017. Palaeontological Impact Assessment for the Development of the Proposed Ventersburg Project-An Underground Mining Operation near Ventersburg and Henneman, Free State Province. Bloemfontein.

Butler, E. 2017. Palaeontological desktop assessment of the proposed development of a 3000 MW combined cycle gas turbine (CCGT) in Richards Bay, Kwazulu-Natal. Bloemfontein.

Butler, E. 2017. Palaeontological Impact Assessment for the Development of the Proposed Revalidation of the lapsed General Plans for Elliotdale, Mbhashe Local Municipality. Bloemfontein.

Butler, E. 2017. Palaeontological assessment of the proposed development of a 3000 MW Combined Cycle Gas Turbine (CCGT) in Richards Bay, Kwazulu-Natal. Bloemfontein.

Butler, E. 2017. Palaeontological Impact Assessment of the proposed development of the new open cast mining operations on the remaining portions of 6, 7, 8 and 10 of the farm Kwaggafontein

8 10 in the Albert Luthuli Local Municipality, Gert Sibande District Municipality, Mpumalanga Province. Bloemfontein.

Butler, E. 2017. Palaeontological Impact Assessment of the proposed mining of the farm Zandvoort 10 in the Albert Luthuli Local Municipality, Gert Sibande District Municipality, Mpumalanga Province. Bloemfontein.

Butler, E. 2017. Palaeontological Desktop Assessment for the proposed Lanseria outfall sewer pipeline in Johannesburg, Gauteng Province. Bloemfontein.

Butler, E. 2017. Palaeontological Desktop Assessment of the proposed development of open pit mining at Pit 36W (New Pit) and 62E (Dishaba) Amandelbult Mine Complex, Thabazimbi, Limpopo Province. Bloemfontein.

Butler, E. 2017. Palaeontological impact assessment of the proposed development of the sport precinct and associated infrastructure at Merrifield Preparatory school and college, Amathole Municipality, East London. PGS Heritage. Bloemfontein.

Butler, E. 2017. Palaeontological impact assessment of the proposed construction of the Lehae training and fire station, Lenasia, Gauteng Province. Bloemfontein.

Butler, E. 2017. Palaeontological Desktop Assessment of the proposed development of the new open cast mining operations of the Impunzi mine in the Mpumalanga Province. Bloemfontein.

Butler, E. 2017. Palaeontological Desktop Assessment of the construction of the proposed Viljoenskroon Munic 132 KV line, Vierfontein substation and related projects. Bloemfontein.

Butler, E. 2017. Palaeontological Desktop Assessment of the proposed rehabilitation of 5 ownerless asbestos mines. Bloemfontein.

Butler, E. 2017. Palaeontological Desktop Assessment of the proposed development of the Lephalale coal and power project, Lephalale, Limpopo Province, Republic of South Africa. Bloemfontein.

Butler, E. 2017. Palaeontological Impact Assessment of the proposed construction of a 132KV powerline from the Tweespruit distribution substation (in the Mantsopa local municipality) to the Driedorp rural substation (within the Naledi local municipality), Free State province. Bloemfontein.

Butler, E. 2017. Palaeontological Desktop Assessment of the proposed development of the new coal-fired power plant and associated infrastructure near Makhado, Limpopo Province. Bloemfontein.

Butler, E. 2017. Palaeontological Impact Assessment of the proposed construction of a Photovoltaic Solar Power station near Collett substation, Middelberg, Eastern Cape. Bloemfontein.

Butler, E. 2017. Palaeontological Impact Assessment for the proposed township establishment of 2000 residential sites with supporting amenities on a portion of farm 826 in Botshabelo West, Mangaung Metro, Free State Province. Bloemfontein.

Butler, E. 2017. Palaeontological Desktop Assessment for the proposed prospecting right project without bulk sampling, in the Koa Valley, Northern Cape Province. Bloemfontein.

Butler, E. 2017. Palaeontological Desktop Assessment for the proposed Aroams prospecting right project, without bulk sampling, near Aggeneys, Northern Cape Province. Bloemfontein.

Butler, E. 2017. Palaeontological Impact Assessment of the proposed Belvior aggregate quarry II on portion 7 of the farm Maidenhead 169, Enoch Mgijima Municipality, division of Queenstown, Eastern Cape. Bloemfontein.

Butler, E. 2017. PIA site visit and report of the proposed Galla Hills Quarry on the remainder of the farm Roode Krantz 203, in the Lukhanji Municipality, division of Queenstown, Eastern Cape Province. Bloemfontein.

Butler, E. 2017. Palaeontological Impact Assessment of the proposed construction of Tina Falls Hydropower and associated power lines near Cumbu, Mthlontlo Local Municipality, Eastern Cape. Bloemfontein.

Butler, E. 2017. Palaeontological Desktop Assessment of the proposed construction of the Mangaung Gariep Water Augmentation Project. Bloemfontein.

Butler, E. 2017. Palaeontological Impact Assessment of the proposed Belvoir aggregate quarry II on portion 7 of the farm Maidenhead 169, Enoch Mgijima Municipality, division of Queenstown, Eastern Cape. Bloemfontein.

Butler, E. 2017. Palaeontological Impact Assessment of the proposed construction of the Melkspruit-Rouxville 132KV Power line. Bloemfontein.

Butler, E. 2017 Palaeontological Desktop Assessment of the proposed development of a railway siding on a portion of portion 41 of the farm Rustfontein 109 is, Govan Mbeki local municipality, Gert Sibande district municipality, Mpumalanga Province. Bloemfontein.

Butler, E. 2017. Palaeontological Impact Assessment of the proposed consolidation of the proposed Ilima Colliery in the Albert Luthuli local municipality, Gert Sibande District Municipality, Mpumalanga Province. Bloemfontein.

Butler, E. 2017. Palaeontological Desktop Assessment of the proposed extension of the Kareerand Tailings Storage Facility, associated borrow pits as well as a storm water drainage channel in the Vaal River near Stilfontein, North West Province. Bloemfontein.

Butler, E. 2017. Palaeontological Desktop Assessment of the proposed construction of a filling station and associated facilities on the Erf 6279, district municipality of John Taolo Gaetsewe District, Ga-Segonyana Local Municipality Northern Cape. Bloemfontein.

Butler, E. 2017. Palaeontological Desktop Assessment of the proposed of the Lephalale Coal and Power Project, Lephalale, Limpopo Province, Republic of South Africa. Bloemfontein.

Butler, E. 2017. Palaeontological Desktop Assessment of the proposed Overvaal Trust PV Facility, Buffelspoort, North West Province. Bloemfontein.

Butler, E. 2017. Palaeontological Impact Assessment of the proposed development of the H2 Energy Power Station and associated infrastructure on Portions 21; 22 And 23 of the farm Hartebeestspruit in the Thembisile Hani Local Municipality, Nkangala District near Kwamhlanga, Mpumalanga Province. Bloemfontein.

Butler, E. 2017. Palaeontological Impact Assessment of the proposed upgrade of the Sandriver Canal and Klippan Pump station in Welkom, Free State Province. Bloemfontein.

Butler, E. 2017. Palaeontological Impact Assessment of the proposed upgrade of the 132kv and 11kv power line into a dual circuit above ground power line feeding into the Urania substation in Welkom, Free State Province. Bloemfontein.

Butler, E. 2017. Palaeontological Desktop Assessment of the proposed Swaziland-Mozambique border patrol road and Mozambique barrier structure. Bloemfontein.

Butler, E. 2017. Palaeontological Impact Assessment of the proposed diamonds alluvial & diamonds general prospecting right application near Christiana on the remaining extent of portion 1 of the farm Kaffraria 314, registration division HO, North West Province. Bloemfontein.

Butler, E. 2017. Palaeontological Desktop Assessment for the proposed development of Wastewater Treatment Works on Hartebeesfontein, near Panbult, Mpumalanga. Bloemfontein.

Butler, E. 2017. Palaeontological Desktop Assessment for the proposed development of Wastewater Treatment Works on Rustplaas near Piet Retief, Mpumalanga. Bloemfontein.

Butler, E. 2018. Palaeontological Impact Assessment for the Proposed Landfill Site in Luckhoff, Letsemeng Local Municipality, Xhariep District, Free State. Bloemfontein.

Butler, E. 2018. Palaeontological Impact Assessment of the proposed development of the new Mutsho coal-fired power plant and associated infrastructure near Makhado, Limpopo Province. Bloemfontein.

Butler, E. 2018. Palaeontological Impact Assessment of the authorisation and amendment processes for Manangu mine near Delmas, Victor Khanye local municipality, Mpumalanga. Bloemfontein.

Butler, E. 2018. Palaeontological Desktop Assessment for the proposed Mashishing township establishment in Mashishing (Lydenburg), Mpumalanga Province. Bloemfontein.

Butler, E. 2018. Palaeontological Desktop Assessment for the Proposed Mlonzi Estate Development near Lusikisiki, Ngquza Hill Local Municipality, Eastern Cape. Bloemfontein.

Butler, E. 2018. Palaeontological Phase 1 Assessment of the proposed Swaziland-Mozambique border patrol road and Mozambique barrier structure. Bloemfontein.

Butler, E. 2018. Palaeontological Desktop Assessment for the proposed electricity expansion project and Sekgame Switching Station at the Sishen Mine, Northern Cape Province. Bloemfontein.

Butler, E. 2018. Palaeontological field assessment of the proposed construction of the Zonnebloem Switching Station (132/22kV) and two loop-in loop-out power lines (132kV) in the Mpumalanga Province. Bloemfontein.

Butler, E. 2018. Palaeontological Field Assessment for the proposed re-alignment and de-commisioning of the Firham-Platrand 88kv Powerline, near Standerton, Lekwa Local Municipality, Mpumalanga province. Bloemfontein.

Butler, E. 2018. Palaeontological Desktop Assessment of the proposed Villa Rosa development In the Buffalo City Metropolitan Municipality, East London. Bloemfontein.

Butler, E. 2018. Palaeontological field Assessment of the proposed Villa Rosa development In the Buffalo City Metropolitan Municipality, East London. Bloemfontein.

Butler, E. 2018. Palaeontological desktop assessment of the proposed Mookodi – Mahikeng 400kV line, North West Province. Bloemfontein.

Butler, E. 2018. Palaeontological Desktop Assessment for the proposed Thornhill Housing Project, Ndlambe Municipality, Port Alfred, Eastern Cape Province. Bloemfontein.

Butler, E. 2018. Palaeontological desktop assessment of the proposed housing development on portion 237 of farm Hartebeestpoort 328. Bloemfontein.

Butler, E. 2018. Palaeontological desktop assessment of the proposed New Age Chicken layer facility located on holding 75 Endicott near Springs in Gauteng. Bloemfontein.

Butler, E. 2018 Palaeontological Desktop Assessment for the development of the proposed Leslie 1 Mining Project near Leandra, Mpumalanga Province. Bloemfontein.

Butler, E. 2018. Palaeontological field assessment of the proposed development of the Wildealskloof mixed use development near Bloemfontein, Free State Province. Bloemfontein.

Butler, E. 2018. Palaeontological Field Assessment of the proposed Megamor Extension, East London. Bloemfontein.

Butler, E. 2018. Palaeontological Impact Assessment of the proposed diamonds Alluvial & Diamonds General Prospecting Right Application near Christiana on the Remaining Extent of Portion 1 of the Farm Kaffraria 314, Registration Division HO, North West Province. Bloemfontein.

CONFERENCE CONTRIBUTIONS

NATIONAL

PRESENTATION

Butler, E., Botha-Brink, J., and F. Abdala. A new gorgonopsian from the uppermost *Dicynodon Assemblage Zone*, Karoo Basin of South Africa.18 the Biennial conference of the PSSA 2014.Wits, Johannesburg, South Africa.

INTERNATIONAL

Attended the Society of Vertebrate Palaeontology 73th Conference in Los Angeles, America. October 2012.

CONFERENCES: POSTER PRESENTATION

NATIONAL

Butler, E., and J. Botha-Brink. Cranial skeleton of *Galesaurus planiceps*, implications for biology and lifestyle. University of the Free State Seminar Day, Bloemfontein. South Africa. November 2007.

Butler, E., and J. Botha-Brink. Postcranial skeleton of *Galesaurus planiceps*, implications for biology and lifestyle.14th Conference of the PSSA, Matjesfontein, South Africa. September 2008:

Butler, E., and J. Botha-Brink. The biology of the South African non-mammaliaform cynodont *Galesaurus planiceps*.15th Conference of the PSSA, Howick, South Africa. August 2008.

INTERNATIONAL VISITS

Natural History Museum, London July 2008

Paleontological Institute, Russian Academy of Science, Moscow

November 2014

CURRICULUM VITAE
Dr Brian Michael Colloty
7212215031083

1 Rossini Rd
Pari Park
Port Elizabeth, 6070
brian@itsnet.co.za
083 498 3299

Profession: Ecologist & Environmental Assessment Practitioner (Pr. Sci. Nat. 400268/07)
Member of the South African Wetland Society
Specialisation: Ecology and conservation importance rating of inland habitats, wetlands, rivers & estuaries
Years experience: 25 years

SKILLS BASE AND CORE COMPETENCIES

- 25 years experience in environmental sensitivity and conservation assessment of aquatic and terrestrial systems inclusive of Index of Habitat Integrity (IHI), WET Tools, Riparian Vegetation Response Assessment Index (VEGRAI) for Reserve Determinations, estuarine and wetland delineation throughout Africa. Experience also includes biodiversity and ecological assessments with regard sensitive fauna and flora, within the marine, coastal and inland environments. Countries include Mozambique, Kenya, Namibia, Central African Republic, Zambia, Eritrea, Mauritius, Madagascar, Angola, Ghana, Guinea-Bissau and Sierra Leone. Current projects also span all nine provinces in South Africa.
- 15 years experience in the coordination and management of multi-disciplinary teams, such as specialist teams for small to large scale EIAs and environmental monitoring programmes, throughout Africa and inclusive of marine, coastal and inland systems. This includes project and budget management, specialist team management, client and stakeholder engagement and project reporting.
- GIS mapping and sensitivity analysis

TERTIARY EDUCATION

- 1994: B Sc Degree (Botany & Zoology) - NMU
- 1995: B Sc Hon (Zoology) - NMU
- 1996: M Sc (Botany - Rivers) - NMU
- 2000: Ph D (Botany – Estuaries & Mangroves) – NMU

EMPLOYMENT HISTORY

- 1996 – 2000 Researcher at Nelson Mandela University – SAB institute for Coastal Research & Management. Funded by the WRC to develop estuarine importance rating methods for South African Estuaries
- 2001 – January 2003 Training development officer AVK SA (reason for leaving – sought work back in the environmental field rather than engineering sector)
- February 2003- June 2005 Project manager & Ecologist for Strategic Environmental Focus (Pretoria) – (reason for leaving – sought work related more to experience in the coastal environment)
- July 2005 – June 2009 Principal Environmental Consultant Coastal & Environmental Services (reason for leaving – company restructuring)
- June 2009 – August 2018 Owner / Ecologist of Scherman Colloty & Associates cc
- August 2018 Owner / Ecologist - EnviroSci (Pty) Ltd

SELECTED RELEVANT PROJECT EXPERIENCE

World Bank IFC Standards

- Kenmare Mining Pilivilli, Mozambique - wetland (mangroves, peatlands and estuarine) assessment and biodiversity offset analysis - current
- Botswana South Africa 400kv transmission line (400km) biodiversity assessment on behalf of Aurecon - current
- Farim phosphate mine and port development, Guinea Bissau – biodiversity and estuarine assessment on behalf of Knight Piesold Canada – 2016.
- Tema LNG offshore pipeline EIA – marine and estuarine assessment for Quantum Power (2015).
- Colluli Potash South Boulder, Eritrea, SEIA marine baseline and hydrodynamic surveys co-ordinator and coastal vegetation specialist (coastal lagoon and marine) (on-going).
- Wetland, estuarine and riverine assessment for Addax Biofeuls Sierra Leone, Makeni for Coastal & Environmental Services: 2009
- ESHIA Project manager and long-term marine monitoring phase coordinator with regards the dredge works required in Luanda bay, Angola. Monitoring included water quality and biological changes in the bay and at the offshore disposal outfall site, 2005-2011

South African

- Plant search and rescue, for NMBM (Driftsands sewer, Glen Hurd Drive), Department of Social Development (Military veterans housing, Despatch) and Nxuba Wind Farm, - current
- Wetland specialist appointed to update the Eastern Cape Biodiversity Conservation Plan, for the Province on behalf of EOH CES appointment by SANBI – current. This includes updating the National Wetland Inventory for the province, submitting the new data to CSIR/SANBI.
- CDC IDZ Alien eradication plans for three renewable projects Coega Wind Farm, Sonop Wind Farm and Coega PV, on behalf of JG Afrika (2016 – 2017).
- Nelson Mandela Bay Municipality Baakens River Integrated Wetland Assessment (Inclusive of Rehabilitation and Monitoring Plans) for CEN IEM Unit - Current
- Rangers Biomass Gasification Project (Uitenhage), biodiversity and wetland assessment and wetland rehabilitation / monitoring plans for CEM IEM Unit – current.
- Gibson Bay Wind Farm implementation of the wetland management plan during the construction and operation of the wind farm (includes surface / groundwater as well wetland rehabilitation & monitoring plan) on behalf of Enel Green Power - current
- Gibson Bay Wind Farm 133kV Transmission Line wetland management plan during the construction of the transmission line (includes wetland rehabilitation & monitoring plan) on behalf of Eskom – 2016.
- Tsitsikamma Community Wind Farm implementation of the wetland management plan during the construction of the wind farm (includes surface / biomonitoring, as well wetland rehabilitation & monitoring plan) on behalf of Cennergi – completed May 2016.
- Alicedale bulk sewer pipeline for Cacadu District, wetland and water quality assessment, 2016
- Mogalakwena 33kv transmission line in the Limpopo Province, on behlaf of Aurecon, 2016
- Cape St Francis WWTW expansion wetland and passive treatment system for the Kouga Municipality, 2015
- Macindane bulk water and sewer pipelines wetland and wetland rehabilitation plan 2015
- Eskom Prieska to Copperton 132kV transmission line aquatic assessment, Northern Cape on behalf of Savannah Environmental 2015.
- Joe Slovo sewer pipeline upgrade wetland assessment for Nelson Mandela Bay Municipality 2014
- Cape Recife Waste Water Treatment Works expansion and pipeline aquatic assessment for Nelson Mandela Bay Municipality 2013
- Pola park bulk sewer line upgrade aquatic assessment for Nelson Mandela Bay Municipality 2013
- Transnet Freight Rail – Swazi Rail Link (Current) wetland and ecological assessment on behalf of Aurecon for the proposed rail upgrade from Ermelo to Richards Bay
- Eskom Transmission wetland and ecological assessment for the proposed transmission line between Pietermaritzburg and Richards Bay on behalf of Aurecon (2012).
- Port Durnford Exarro Sands biodiversity assessment for the proposed mineral sands mine on behalf of Exxaro (2009)
- Fairbreeze Mine Exxaro (Mtunzini) wetland assessment on behalf of Strategic Environmental Services (2007).
- Wetland assessment for Richards Bay Minerals (2013) – Zulti North haul road on behalf of RBM.
- Biodiversity and aquatic assessments for 105 renewable projects in the past 6 years in the Western, Eastern, Northern Cape, KwaZulu-Natal and Free State provinces. Clients included RES-SA, RedCap, ACED Renewables, Mainstream Renewable, GDF Suez, Globeleq, ENEL, Abengoa amongst others. Particular aquatic sensitivity assessment and Water Use License Applications on behalf of Mainstream Renewable Energy (8 wind farms and 3 PV facilities.), Cennergi / Exxaro (2 Wind farm), WKN Wind current (2 wind farms & 2 PV facilities), ACED (6 wind farms) and Windlab (3 Wind farms) were also conducted. Several of these projects also required the assessment of the proposed transmission lines and switching stations, which were conducted on behalf of Eskom.
- Vegetation assessments on the Great Brak rivers for Department of Water and Sanitation, 2006 and the Gouritz Water Management Area (2014)
- Proposed FibreCo fibre optic cable vegetation assessment along the PE to George, George to Graaf Reinet, PE to Colesburg, and East London to Bloemfontein on behalf of SRK (2013-2015).

srk consulting

Resume

Chris Dalgliesh

Principal Consultant

Profession	Environmental Practitioner
Education	MPhil (EnvSci) with Distinction, Cape Town, 1994 BBusSc (Hons), Cape Town, 1985
Registrations/ Affiliations	Cert Envir Assessment Practitioner (South Africa) (10/2002) Member International Association of Impact Assessment Director SRK South Africa 2018 - Director SRK Investments 2011 - Director SRK Global 2013 - 2017 SRK Cape Town Managing Partner 2007 - 2015

Specialisation

Environmental management consulting.

Expertise

Chris Dalgliesh has been involved in environmental projects for the past 24 years. His expertise includes:

- EIA and ESIA (EMPR);
- environmental and social due diligence;
- socio-economic impact assessments;
- stakeholder engagement;
- strategic environment assessments and management plans;
- state of environment reporting;
- environmental management frameworks;
- site safety reports for the nuclear industry;
- natural resource management;
- waste management.

Employment

2000 – Present	SRK Consulting (Pty) Ltd, Director, Partner and Principal Environmental Consultant
1999 – 2000	Arcus Gibb (Pty) Ltd, Associate, Cape Town, South Africa
1996 – 1998	African Environmental Solutions (Pty) Ltd, Senior Environmental Consultant
1994 – 1996	Environmental Evaluation Unit, Environmental Consultant, UCT
1991 – 1993	Novello Music Publishers, Marketing Manager, London, UK
1988 – 1990	JR Phillips, Product Manager, Wokingham, UK
1986 – 1988	Unilever, Trade and Assistant Brand Manager, Durban, South Africa

Publications

I have been interviewed and quoted in numerous environmental and sustainability articles published in the press and sector specific journals, including *Engineering News, Mining News, Business Report and Cape Times,* and am a frequent guest lecturer.

Languages

English – read, write, speak

Afrikaans – read, write, speak

Dutch - read

Chris Dalgliesh
Principal Consultant

Environmental and Social Impact Assessment (ESIA) and Environmental Management Programmes (EMP)

- Ricocure (Pty) Ltd, EIA for Exploration Right application for Offshore Block 3B, West Coast, South Africa, 2018-ongoing, R150 000
- Sezigyn (Pty) Ltd, EIA for Exploration Right application for Offshore Mid-Orange Basin, West Coast, South Africa, 2018-ongoing, R150 000
- Rheinmetall Denel, Multi Purpose Nitration Plant EIA, Wellington, Western Cape Province, South Africa, 2018, R650, 000
- Impact Oil and Gas, Orange Deep Basin Seismic Survey EIA, Offshore West Coast, South Africa, 2017, R600,000
- AES, Bengo Landfill EIA, Angola, 2017, US$80,000
- Sungu Sungu Oil (Pty) Ltd, Pletmos Basin EIA, Offshore Southern Cape, South Africa, 2017, R525,000
- City of Cape Town, Vissershok North Landfill Waste Management Licence, Cape Town, Western Cape Province, 2016 – ongoing, R750,000
- Mineral Sand Resources, Tormin Mine EIA, Lutzville, Western Cape Province, 2016 – ongoing R1,250,000
- Department of Agriculture, Forestry and Fisheries, Project Definition and EIA for a proposed Aquaculture Development Zone in Saldanha Bay, Western Cape, 2016 – ongoing, R1,000,000
- Easigas, EIA for LNG Plant, Mossel Bay, Western Cape Province, South Africa, 2016 – ongoing, R600,000
- Gyproc St Gobain, EMPr for gypsum mine, Vanrhynsdorp, Western Cape Province, South Africa, 2016, R125,000
- Tronox Namakwa Sands, EIA for new slimes dam, Brand se Baai, Western Cape Province, South Africa, 2015 – ongoing, R900,000
- The River Club, EIA for redevelopment of the property, Cape Town, Western Cape Province, South Africa, 2015 – ongoing, R1 500,000
- SIMO Petroleum Ltd, ESIA for fuel supply project, Guinea, 2015, US$200,000
- SIMO Petroleum Ltd, EIA for fuel supply project, Liberia, 2015, US$200,000
- Eskom, EIA for Transient Interim Storage Facility, Western Cape, South Africa, 2015 – ongoing, R900,000
- Falcon Oil & Gas, Environment Management Programme Report (EMPr) update and engagement, Western, Northern and Eastern Cape, South Africa, 2014 – 2015, US$90,000
- Department of Environmental Affairs (DEA), Waste Management Licence applications and Basic Assessment for 20 waste facilities, Western Cape, South Africa, 2014 – 2015, R2,600,000
- Sable Mining / West Africa Explorations (WAE), Cumulative Impact Assessment (CIA) for WAE's Nimba iron ore mine, Guinea, May 2014 – on hold, US$90,000
- De Beers Buffalo Camp, Basic Assessment and EMPr Amendment, Kimberley, Northern Cape, 2014, R260,000
- EFG Engineers, EIA for Hermanus bypass road, Western Cape Province, South Africa, 2014 – 2017, R1,200,000
- SRK Turkey, CIA of Copler gold mine, Turkey, 2014, US$30,000
- Sable Mining Africa Ltd, ESIA for railway line and port expansion, Liberia, 2014, US$480,000

Chris Dalgliesh
Principal Consultant

- Tronox Namakwa Sands, EIA for abalone farm, Brand se Baai, Western Cape Province, South Africa, 2014 – ongoing, R1,050,000
- Matzikamma Municipality, EIAs for three abalone farms, Doringbaai, Western Cape Province, South Africa, 2014 – ongoing, R1,100,000
- De Beers, EMPr amendment for fine residue pond, Kimberley, South Africa, 2013, R120,000
- AES, ESIA of landfill, Soyo, Angola, 2013, US$70,000
- PetroSA, EIA of offshore gasfield, Southern Cape, South Africa, 2013 – ongoing, R500,000
- EnergieBedrijven Suriname, ESIA for new power plant, Suriname, 2013, US$135,000
- AES, ESIA of Thermal Desorption Unit, Soyo, Angola, 2013, US$65,000
- Staatsolie Maatschappij Suriname, Rapid EIA of power plant expansion, Suriname, September 2012 – 2014, US$100,000
- BP, ESIA of Blocks 18 & 31 Drilling and Seismic Survey, Angola, 2012, US$40,000
- Frontier, EIA for desalination plant and water pipeline, Abraham Villiers Bay, Northern Cape, South Africa, August 2012 – ongoing, R1,250,000
- Tronox Namakwa Sands, EIA /EMPr for two mining application areas, Namakwaland, Western Cape Province, South Africa, 2012 – ongoing, R1,250,000
- Airports Company South Africa, EIA of realignment of runway, Cape Town International Airport, Western Cape, South Africa, R3,175,000
- Grindrod Mauritius, EIA of Matola Coal Terminal Phase 4 Expansion, Maputo, Mozambique, 2012 - 2013, US$425,000
- Maersk, ESIA of Block 16 Seismic Survey, Angola, 2010 – 2011, US$25,000
- Staatsolie Maatschappij Suriname, EIA for diesel, gasoline and LGP pipelines, Suriname, October 2011 – 2013, US$120,000
- Premier Fishing, EIA for re-establishment of fishmeal plant, Saldanha Bay, South Africa, May 2011 – 2015, R1,200,000
- Eni Angola BV, ESIA of development of Block 15/06 West Hub oil fields, Angola, 2011 - 2013, US$110,000
- Falcon Oil & Gas, EMPr, Western, Northern and Eastern Cape, South Africa, 2010 – 2011, US$100,000
- Great Western Minerals Group, EIA and EMPr of rare earth mine, Vanrhynsdorp, Western Cape, South Africa, 2010 – 2012, R1,760,000
- Vale, ESIA of phosphate mine, Nampula Province, Mozambique, 2010 – 2013, US$630,000
- Sonangol Lda, EIA (x6) of onshore hydrocarbon facilities, Luanda, Malange and Lubango, Angola, March – November 2010, US$280,000
- Empresa Moçambicana de hidrocarbonetos and Buzi Hydrocarbons Pty Ltd, ESIA for seismic surveys and exploration drilling in Buzi Block, Sofala Province, Mozambique, 2009 – 2010, US$200,000
- Staatsolie, ESIA of refinery expansion, Paramaribo, South America, 2009 – 2010, US$400,000
- Sasol Technology, EIA for proposed new gas pipeline from Ressano Garcia to Moamba, Mozambique, Moamba, Mozambique, 2009 – 2010, R1,000,000
- Anglo American, State of Environment Report, Strategic Environment Assessment, and ESIA of Gamsberg zinc mine, Aggeneys, South Africa, 2008 – 2010, R13,000,000

Chris Dalgliesh
Principal Consultant

- CIC Energy, Environmental screening and fatal flaw assessment of Trans Kalahari Railroad and port, Botswana and Namibia, 2008 – present, R1,300,000
- BHP Billiton, ESIA of Corantijn River dredging, Suriname, 2007 – 2008, US$750,000
- BHP Billiton, ESIA of Bakhuis transport project, Suriname, 2006 – 2008, US$1,600,000
- Altona Developments, EIA of mixed development, Worcester, Western Cape Province, South Africa, 2006 – 2010, R750,000
- BHP Billiton, ESIA of Bakhuis bauxite mine, Suriname, 2005 – 2008, US$3,200,000
- Levendal Developments (Pty) Ltd, EIA of mixed development, Suider-Paarl, Western Cape Province, South Africa, 2005 – 2008, R450,000
- Bevcan, Angola, EIA of canning facility, Viana, Angola, 2005 -2010, US$75,000
- Chevron Texaco, EIA of landifll, Cabinda, Angola, 2004 – 2005, US$90,000
- Attpower Developments (Pty) Ltd, EIA of mixed coastal development, Mossel Bay, Western Cape Province, South Africa, 2004, R600,000
- Intels Services Luanda, EIA of landifll, Cacuaco, Angola, 2004, US$65,000
- Kwezi V3, EIA of waste water treatment works, Gansbaai, Western Cape Province, South Africa, 2003 – 2005, R350,000
- City of Cape Town, EIA of Fisantekraal waste water treatment works, Cape Town, Western Cape Province, South Africa, 2003 – 2004, R450,000
- St Francis Bay Municipality, EIA of beach remediation, St. Francis Bay, Eastern Cape Province, South Africa, 2002 – 2003, R300,000
- City of Cape Town, Environmental Impact Control Report of Vissershok North landfill, Western Cape Province, South Africa, 2001 – 2004, R175,000
- NDC, EMPr for NDC diamond mine, Vredendal district, Western Cape Province, South Africa, 2001 – 2003, R800,000
- Coega Development Corporation, EIA for rezoning, Eastern Cape Province, South Africa, 1999, R85,000
- BHP Billiton, EIA (Scoping) of Alusaf Hillside smelter, Richards Bay, KwaZulu-Natal Province, South Africa, 1999, R150,000
- Gencor, EIA of zinc refinery and phosphoric acid plant, Port Elizabeth, Eastern Cape Province, South Africa, 1995 – 1998, R800,000
- Duferco, EIA of steel rolling mini-mill, Saldanha, Western Cape Province, South Africa, 1997, R90,000
- Hoechst, EIA of polymer extension, Durban, KwaZulu-Natal Province, South Africa, 1993 – 1994, R280,000

Environmental Planning and Natural Resource Management

- Tronox Mineral Sands (Pty) Ltd, renewal of the Atmospheric Emission Licence for the Namakwa Sands UMM Plant, Brand-se-Baai, Western Cape, 2018-ongoing, R320 000
- Tronox Mineral Sands (Pty) Ltd, renewal of the Atmospheric Emission Licence for the Namakwa Sands Mineral Separation Plant, Koekenaap, Western Cape, 2018-ongoing, R290 000
- Tronox Mineral Sands (Pty) Ltd, renewal and variation of the Atmospheric Emission Licence for the Namakwa Sands Smelter Plant, Saldanha, Western Cape, 2018-ongoing, R300 000
- Kudumane Manganese Resources, EMP Amendment for KMR Manganeese Mine, Hotazel, Northern Cape, 2017 – ongoing, R170 000

- Eskom, Ecological Reports, Duynefontyn and Thyspunt, Nuclear Site Safety Reports Update, South Africa, 2017 – present, R800,000
- DEA&DP, Western Cape State of Environmental Report, 2017, R1,700,000
- Tronox Namakwa Sands, Development of Closure Commitments and Rehabilitation Monitoring Plan Namakwaland, Western Cape Province, South Africa, 2015 – ongoing, R600,000
- West Coast District Municipality, Integrated Coastal Management Plan, West Coast, South Africa, 2012 – 2013, R700,000
- City of Cape Town, Environmental Management Framework and control zones, Cape Town, Western Cape Province, South Africa, 2008 – 2009, R600,000
- Eskom, Ecological Reports, Koeberg, Bantamsklip and Thyspunt, South Africa, 2008 – 2013, R900,000
- City of Cape Town, Environmental Management Framework and control zones, Cape Town, Western Cape Province, South Africa, 2008, R500,000
- Knysna Municipality, State of Environmental Report, Western Cape Province, South Africa, 2004 – 2005, R130,000
- DEA&DP, Western Cape State of Environmental Report, 2004 – 2005, R1,400,000

Environmental and Social Review and Due Diligence

- Kropz, Environmental and Social Due Diligence for Competent Persons' Report, Elandsfontein mine, Langebaan, South Africa, 2018, R130,000
- Standard Bank South Africa Limited, Environmental and Social Due Diligence and Environmental and Social Action Plan (ESAP) for Caculo Cabaca Hydropower Dam, Angola, 2017, $23 000
- Voith Hydro, Zenzo Hydroelectric Project Gap Analysis and Environmental and Social Action Plan, Angola, 2017, €30 000
- Voith Hydro, Koysha Hydroelectric Project Gap Analysis, Ethiopia, 2017, €15 000
- AES, Cacuaco Landfill Environmental Compliance Audit, Luanda, Angola, 2017, US$17,500
- Industrial and Commercial Bank of China, Environmental and Social Due Diligence and Environmental and Social Action Plan (ESAP), and Annual Compliance Audits for Caculo Cabaca Hydropower Dam, Angola, 2016-2017, $31 000
- Deutsche Bank, Environmental and Social Due Diligence and Annual Review of Be'er Tuvia Combined Cycle Gas Turbine Power Plant, Israel, 2016 – 2021, €150 000
- Confidential, Environmental and Social Gap Analysis of Caculo Cabaca Hydropower Dam, Angola, 2016, €20 000
- BNP Paribas, Environmental and Social Due Diligence of Elandsfontein mine, Langebaan, South Africa, 2015, R60,000
- Tronox Namakwa Sands, Water Use Licence Audit(s), Namakwaland, Western Cape Province, South Africa, 2015 and 2014, R175,000 (x2)
- Tronox Namakwa Sands, EMPr Performance Assessment, Namakwaland, Western Cape Province, South Africa, 2014, R175,000
- Deutsche Bank, Environmental and Social Due Diligence and Annual Review of Lauca Hydropower Dam, Angola, 2014 – 2018, €300 000
- West Africa Exploration Ltd, Environment and social gap analysis of Nimba iron ore mine, Guinea, 2014, US$80,000

- HSBC, Environmental and Social Due Diligence and Annual Review, Cambambe Hydropower Dam, Angola, 2013 – 2017, €255,000
- Tronox Namakwa Sands, EMPr Performance Assessment, Namakwaland, Western Cape Province, South Africa, 2012 – 2013, R150,000
- Biovac, Environmental due diligence audit of pharmaceutical plant, Cape Town, Western Cape Province, South Africa, 2012, R100,000
- SRK UK, Environmental Due Diligence of phosphate mine, Brazil, 2010, US$15,000
- SRK Russia, Environmental Due Diligence of Rossing South uranium mine, Namibia, 2009, US$12,000
- SonaGas, EIA external review of LNG plant EIA, Soyo, Angola, 2006, US$50,000
- Confidential, Environmental Due Diligence, Cape Town, Western Cape Province, South Africa, 2004, R80,000
- Netherlands Commission for EIA, External EIA review of Mavoco hazardous landfill EIA, Maputo, Mozambique, 2002, R30,000

Management Plans

- West Africa Exploration Ltd, Stakeholder Engagement Plan, Guinea, 2014, US$15,000
- West Africa Exploration Ltd, Biodiversity Action Plan, Guinea, 2014, US$20,000
- Tronox Namakwa Sands, Integrated Water and Waste Management Plan for Namakwa Sands mine, Namakwaland, Western Cape Province, South Africa, 2013 – 2014, R125,000
- Tronox Namakwa Sands, Integrated Water and Waste Management Plan for Namakwa Sands Smelter, Saldanha Bay, Western Cape Province, South Africa, 2013, R110,000
- BHP Billiton, Conceptual Closure and Rehabilitation Plan, Suriname, 2007 – 2013, US$210,000
- Namakwa Sands, Closure Plan, Namakwaland, Northern Cape Province, South Africa, 2003, R170,000

Socio Economic Impact Assessments

- Allied Gold Corp, Economic specialist study for the Dish Mountain Gold Project, Ethiopia, 2018 – ongoing, $11 000
- Joule Africa, Initial Environmental and Social Assessment of the KPEP Hydropower Project, Cameroon, 2018 – ongoing, $10,800
- Anglo Gold Ashanti, Economic Baseline Report for Siguiri Gold Mine, Guinea, 2018, R130 000
- Pam Golding / Pennyroyal (Gibraltar) Ltd., Economics benefits analysis of Amber Resort Development, Zanzibar, Tanzania, 2017, R300 000
- RSK, EACOP Pipeline Economic Study, Uganda and Tanzania, 2017, $ 40,000
- SRK UK, Sintoukola Potash Mine Economic Impact Assessment, Republic of Congo, 2012, $30,000
- Staatsolie Maatschappij Suriname, Refinery Expansion Community Relations Plan, Suriname, 2011, $120,000
- SRK UK, Reko Diq Phosphate Mine Review of Economic Impact Assessment, Pakistan, 2010, $7,500
- DEADP, Western Cape State of the Environment Report Economic Study, 2004, R40,000

PROFESSIONAL CURRICULUM
FOR WOUTER FOURIE

Name:	Wouter Fourie
Profession:	Archaeologist
Date of birth:	1974-04-30
Parent Firm:	PGS Heritage (Pty) Ltd
Position at Firm:	Director
Years with firm:	15
Years of experience:	21
Nationality:	South African
HDI Status:	White

EDUCATION:

Name of University or Institution	:	University of Pretoria
Degree obtained	:	BA
Major subjects	:	Archaeology, Geography and Anthropology
Year	:	1996

Name of University or Institution	:	University of Pretoria
Degree obtained	:	BA [Hons] (Cum laude)
Major subjects	:	Archaeology and Geography
Year	:	1997

Name of University or Institution	:	National Nuclear Regulator
Certificate obtained	:	Radiation Protection Officer Certificate
Year	:	1999

Name of University or Institution	:	University of Cape Town
Certificate obtained	:	Project Management Foundations short course
Year	:	2015

Name of University or Institution	:	University of Cape Town
Certificate obtained	:	MPhil – Conservation of Built Environment
Year	:	2016-Current

Professional Qualifications:
Professional Heritage Practitioner – Association of Professional Heritage Practitioners (APHP)
Professional Archaeologist - Association of Southern African Professional Archaeologists - Professional Member – No 043

CRM Accreditation
Principal Investigator - Grave Relocations
Field Director – Iron Age
Field Supervisor – Colonial Period and Stone Age
Accredited with Amafa KZN

Languages:
Afrikaans
English – Speaking (Good) Reading (Good), Writing (Good)

KEY QUALIFICATIONS

- More than 18 consecutive years of work in the heritage consulting field;
- In depth knowledge of heritage management principles;
- 15 years working experience in the protection of cultural heritage sites and archaeological excavations;
- Proven experience in report writing and report deliverables;
- 15 years experience in management of the cultural heritage consultancy teams;
- 10 years of experience in institutional, multinational company interaction and project implementation;
- Proven experience in project scheduling and programming;
- Experience in development and implementation of quality, environmental and environmental health management systems for projects and companies;
- Experience in the development of policies and guidelines related to heritage management.
- Experience in planning and implementation of workshops and conferences.

CONFERENCE PAPERS AND PUBLICATIONS

- 2016 - Implementing Responsible Grave Relocation – The case for Comprehensive Grave Relocation Action Plan for Integrated Project Management. 21st annual IAIAsa conference, Port Elizabeth, Eastern Cape.
- 2012 - Heritage management: compliance or just a nuisance during the Environmental Management Programme implementation. 17th annual IAIAsa conference, Somerset West, Western Cape.
- 2011 – POSTER – W. Fourie and J. van der Walt. Sterkspruit: Micro-layout of Late Iron Age stone walling, Lydenburg, Mpumalanga. . Association of Southern African Professional Archaeologists – Conference, Swazi Land
- 2011 – POSTER – P.D. Birkholtz, W. Fourie and W.C. Nienaber. Onverwacht: Archaeological and Historical Analysis of Swazi settlement layout. Association of Southern African Professional Archaeologists – Conference, Swazi Land
- 2011 – POSTER – H.S. Steyn, W. Fourie and M. Hutten. Kappa Omega Transmission Line: Findings from an Archaeological Walk Down. Association of Southern African Professional Archaeologists – Conference, Swazi Land
- 2011 - Archaeology, Physical Anthropology and DNA analysis – The case of Queen Thomo Jezangani Ndwandwe. *Association of Southern African Professional Archaeologists – Conference, Swaziland*
- 2008 – Probabilistic Modeling of archaeological sites, Pilanesberg National Park. Paper delivered at the *Association of Southern African Professional Archaeologists – Conference, Cape Town*
- 2008 - Archaeological Impact Assessments within South African legislation. *South African Archaeological Bulletin 63 (187): 77–85, 2008*
- 2006 - *Paper delivered at ASAPA conference*, Pretoria. Tavistock: Good grave relocation practice.
- 2005 - Paper delivered at the Three Universities Seminar, University of Pretoria: The repatriation of King Michael Tjiseseta.
- 2005 - 'The Return of a King' - The repatriation of King Michael Tjiseseta, *Paper delivered at the conference of the Pan-African Archaeological Association for Prehistory and Related Studies in Gaborone, Botswana, in July 2005.*
- 2004 - Research poster, Probabilistic Modeling of Archaeological Sites, Pilanesberg National Park. *South African Association of Archaeologist Conference, Kimberley*

INTERNATIONAL PROJECTS

- 2018 – current: **Position:** Heritage Specialist and Project Manager – Sovereign Metals –

Malingunde Graphite Project, Malawi – Heritage Impact Assessment – **Project Value:** R 400 000

- 2017 – current: **Position:** Heritage Specialist and Project Manager – Lesotho Highland Development Authority – Polihali Dam Project - Heritage Management Plan development and Implementation. Mokhotlong, Kingdom of Lesotho – **Project Value:** R 35,5 mil
- 2017 - **Position:** Heritage Specialist and Project Manager – Aurcon Singapore for the Government for Mauritius – Heritage Assessment for the proposed Rapid Rail Link, Port Louis, Mauritius – **Project Value:** R 100, 000
- 2016 – current – **Position:** Heritage Specialist and Project Manager - Anadarko International – Grave Relocation Action Plan and implementation for the Afungi Liquid Natural Gas Project, Palma, Northern Mozambique – **Project Value:** R 2,5 mil
- 2013 – 2016 - **Position:** Heritage Specialist and Project Manager - SLR Consulting - Heritage Impact Assessment, Manica Gold Project, Manica Province, Mozambique - **Project Value:** R 80 000
- 2012 - **Position:** Heritage Specialist and Project Manager - SLR Consulting - Heritage Impact Assessment, Namoya SALR – Gold Mine, Maniema Province in the eastern Democratic Republic of Congo (DRC) - **Project Value:** R 120 000
- 2012 - **Position:** Heritage Specialist and Project Manager - Consolidated Contractors Group S.A.L. -Mitigation and Grave Relocation at Site 37-A3-16 on the Mahalpye to Kudumatse Road Construction Project Central District, Botswana - **Project Value:** R 90 000
- 2010 - **Position:** Heritage Specialist and Project Manager - Digby Wells & Associates - Grave Relocation Procedures and Consultation – RAP Process, Kibali Gold Mine, Watsa, Oriental Province, Democratic Republic of the Congo - **Project Value:** R 85 000
- 2010 - **Position:** Heritage Specialist and Project Manager - Digby Wells & Associates - Archaeological Study, Kibali Gold Mine, Watsa, Oriental Province, Democratic Republic of the Congo - **Project Value:** R 50 000
- 2008 - **Position:** Heritage Specialist and Project Manager - Digby Wells & Associates - Mmamabula Mining Project CIC, Botswana - **Project Value:** R 60 000

HERITAGE IMPACT ASSESSMENTS

South African

Below a selected list of over 400 heritage studies completed

2017

- Manungu Colliery, Heritage Impact Assessment. Carolina, Mpumalanga. – **Position:** Heritage Specialist. **Project Value:** R 65 000.
- Ilima Colliery, Heritage Impact Assessment. Carolina, Mpumalanga. – **Position:** Heritage Specialist. **Project Value:** R 110 000.
- Clanwilliam Dam Heritage Project (2014-2017). Clanwilliam, Western Cape. Department of Water and Sanitation – **Position:** Heritage Specialist. **Project Value:** R 7,5 mil
- Leeuwberg Wind Energy Project. Loeriesfontein, Northern Cape. SiVEST. – **Position:** Heritage Specialist. **Project Value:** R 120 000.
- Leeudoringstad Solar Energy Project. North West Province. SiVEST. – **Position:** Heritage Specialist. **Project Value:** R 50 000.
- Lephalale Combined Power Project, Limpopo Province. Kongiwe Environmental. – **Position:** Heritage Specialist. **Project Value:** R 100 000.
- Lebone Emergency College Upgrade, Pretoria. Department of Infrastructure Development. **Position:** Heritage Specialist. **Project Value:** R 100 000.

2016

- Gautrain Management Agency (SiVEST Environmental) – Gautrain Rapid Rail Link – Feasibility Study – **Position:** Heritage Specialist

- Pilgrim's Rest Housing Development – Heritage Impact Assessment, Mpumalanga. Aurecon. – **Position:** Heritage Specialist. **Project Value:** R 60 000.
- Era Brickworks, Delmas, Mpumalanga. Heritage Impact Assessment. Jones and Wagerner. – **Position:** Heritage Specialist. **Project Value:** R 40 000.
- Daggaskaal Road Upgrade, Mpumalanga. Heritage Impact Assessment. NCC Environmental. – **Position:** Heritage Specialist. **Project Value:** R40 000.
- Eureka and Aletta Wind Energy Projects. Copperton, Northern Cape. – **Position:** Heritage Specialist. **Project Value:** R 95 000.
- Sendawo Solar Project, Vryburg, Northern Cape. Heritage Impact Assessment. SiVEST – **Position:** Heritage Specialist. **Project Value:** R 90 000.
- Tlisitseng Solar Project, Lichtenburg, North West Province. Heritage Impact Assessment. – **Position:** Heritage Specialist. **Project Value:** R 80 000.
- Kuruman 66kV Project. Kuruman, Northern Cape. Zitholele. – **Position:** Heritage Specialist. **Project Value:** R 85 000.
- Goodwood Housing Scheme, WC – Heritage Scoping – **Position:** Heritage Specialist
- Vereeniging Gymnasium, Heritage assessment and Guidelines, Meyerton, Gauteng. – **Position:** Heritage Specialist
- Victoria West, Wind Energy Project. CSIR. – **Position:** Heritage Specialist. **Project Value:** R 120 000.
- Kloof and Driefontein Sibanye Gold. Heritage Management Plan. Carletonville, Gauteng. – **Position:** Heritage Specialist and Project Manager. **Project Value:** R 430 000.

2015

- AEL Detonator Campus, Heritage Impact Assessment. Modderfontein, Gauteng. – **Position:** Heritage Specialist and Project Manager. **Project Value:** R 240 000.
- Solar Reserve (Worley Parson RSA), Heritage Impact Assessment, Humansrus Solar Park, Daniëlskuil, Northern Cape – **Position:** Heritage Specialist
- Kappa-Sterrekus 765kV Project. ACER Africa. Heritage Walkdown. Western Cape. – **Position:** Heritage Specialist. **Project Value:** R 140 000.
- Solar Reserve (Worley Parson RSA), Heritage Impact Assessment, Rooipunt Solar Park, Upington, Northern Cape – **Position:** Heritage Specialist
- Solar Reserve (Worley Parson RSA), Heritage Impact Assessment, Arriesfontein Solar Park, Daniëlskuil, Northern Cape – **Position:** Heritage Specialist
- Solar Reserve (Worley Parson RSA), Heritage Impact Assessment, Slypklip Solar Park, Kimberley, Northen Cape – **Position:** Heritage Specialist
- Mainstream Renewable Power South Africa (SiVest), Heritage Impact Assessment, Loeriesfontein Solar Park, Northern Cape - – **Position:** Heritage Specialist
- Mainstream Renewable Power South Africa (SiVest), Heritage Impact Assessment, De Aar Solar Park, Northern Cape – **Position:** Heritage Specialist
- Mainstream Renewable Power South Africa (SiVest), Heritage Impact Assessment, Droogefontein
- GRAP103 – Heritage Register for the Ekurhuleni Metropolitain Municipality, Aurecon – **Position:** Heritage Specialist
- Fleurhof Hostel Redevelopment. Florida, Gauteng. Heritage Impact Assessment. **Position:** Heritage Specialist and Project Manager. **Project Value:** R 430 000.
- Mkuze Biomassa Incinerator. Mkuze, KZN. Heritage Impact Assessment. CSIR. **Position:** Heritage Specialist and Project Manager. **Project Value:** R 50 000.
- Transnet Overvaal Tunnel, Ermelo, Mpumalanga. EIMS. **Position:** Heritage Specialist and Project Manager. **Project Value:** R 60 000.
- De Aar 132kv Powerline. De Aar, Northern Cape. Heritage Impact Assessment. Holland and Associates. **Position:** Heritage Specialist and Project Manager. **Project Value:** R 60 000.

2014

- Solar Park, Kimberley, Northern Cape – **Position:** Heritage Specialist
- Kumba Iron Ore (Synergistics), Heritage Impact Assessment, Shishen Relocation Project, Northern Cape - – **Position:** Heritage Specialist
- Kappa-Sterrekus 765kV Project. ACER Africa. Heritage Walkdown. Western Cape. – **Position:** Heritage Specialist. **Project Value:** R 140 000.
- Strategic Environmental Assessment for Independent Energy. CSIR. – **Position:** Heritage Specialist. **Project Value:** R 150 000.
- New Kathu Cemetery. Kathu, Northern Cape. Heritage Impact Assessment. SLR Consulting. – **Position:** Heritage Specialist. **Project Value:** R 50 000.

GRAVE RELOCATIONS

- 2015-7 - Optimum Coal Phase 2 – Relocation of 100 graves, Glencore. Pullenshope, Mpumalanga
- 2014 – Bigen Africa. Lufhereng Grave Investigation, Soweto, Gauteng. Principal Investigator.
- 2014 – Basil Read. Savanna City Residential Development. Relocation of 55 graves. Orange Farm, Gauteng. Principal Investigator.
- 2013-6 – Kalgold Project Harmony Gold. Relocation of 20 graves. Kraaipan, North West Province. Principal Investigator.
- 2013-4 – Ivanhoe Mining. Relocation of graves for the Platreef project. Mokopane, Limpopo Province. Principal Investigator.
- 2013-4 – Eskom SOC, Eskom Mookodi Substation grave relocation of 6 graves. Vryburg, North West Province. Principal Investigator.
- 2013 – Ntshovelo Coal. Relocation of 8 graves. Arbor, Mpumalanga.
- 2013 – Msobo Coal. Relocation of 9 graves for the Msobo Coal Lilliput project. Breyten, Mpumalanga. Principal Investigator.
- 2012-4 - Likweti Holdings, Likweti Grave Project, 1 Grave. Nelspruit, Mpumalanga. Principal Investigator
- 2012-3 - Fleurhof Holdings, Fleurhof rescue and grave relocation of 70 graves. Florida, Gauteng. Principal Investigator
- 2012 – 4 - Calgro/M3, Fleurhof grave rescue and relocation, 100 graves Florida, Gauteng. Principal Investigator
- 2012 - Department of Arts and Culture. JL Dube memorial site restoration. Ohlange Institute, Inanda, KwaZulu-Natal. Principal Investigator.
- 2012 - Delmas Super Centre. Delmas grave relocation of 1 grave. Delmas, Mpumalanga.
- 2012 - Anglo Coal, New Largo Colliery. 170 Graves. Ogies, Mpumalanga. Principal Investigator
- 2011-3 - Mashala Resources, Ferreiras Colliery, Ermelo. Relocation of 11 graves. Principal Investigator.
- 2011 - Xtsrata, ATCOM. Bierman cemetery. 14 graves. Principal Investigator Relocation of 8 graves, Kudumatse Road Upgrade, Botswana. Principal Investigator
- 2011 - Seaton Thompson, Kameeldoorn grave relocation. Single grave. Zeerust. Principal Investigator
- 2011 - SAHRA, Relocation of the remains of Queen Thomo KaNdwandwe, Durban, KZN. Principal Investigator
- 2011 - Roadcrete, Lanseria-Randburg Road Upgrade 6 graves, Randburg. Principal Investigator.
- 2011 - New Clydesdale Coal, Relocation of 7 graves from coal project, Witbank. Field Director, under WC Nienaber as PI
- 2011 - Kudumatse Road works. Removal of 11 Iron Age graves. Kudumatse, Botswana. Principal Investigator

- 2010-3 - Optimum Colliery, Hendrina, Mpumalanga. Relocation of 65 graves. Field Director, under WC Nienaber as PI
- 2010 - Investigation on the relocation of 3000 graves, Kibali, DRC. Principal Investigator
- 2010 - Eyethu Coal, Relocation of 7 graves from coal project, Delmas. Field Director, under WC Nienaber as PI
- 2008 - WBHO, Relocation of 5 graves from South Deep tailings project, Fochville Gautemg Province. Field Director, under WC Nienaber as PI
- 2006 - Highland Gate Development. Dullstroom. Gate Developments. Relocation of 39 Graves. Field Director.
- 2006 - Cosmo City Development, Johannesburg. Basil Read Pty Ltd. Relocation of 135 graves. Field Director.
- 2003 - Tselentis Colliery, Duiker Mining. Relocation of 80 graves. Field Director
- 2003 - Alveda Park Development, NewHco. Relocation of 114 graves. Field Director
- 2002 - V3, Brakfontein, Centurion. Reconnaissance excavation on possible grave in new development area. Field Director
- 2002 - Kriel Collieries, Kriel. Investigation into the position of relocated graves on Kriel Golf Course. Principal Investigator
- 2002 - Gardener Ross Golf and Country Estate, DEVCO. Reconnaissance Excavation on possible graves. Field Director
- 2001-2 - iMpunzi Division of Duiker Mining, Witbank, Grave Relocation of 907 graves. Field Director

MITIGATION WORK

1. 2017 – Current - Lesotho Highland Development Authority – Polihali Dam Project - Heritage Management Plan development and Implementation. Mokhotlong, Kingdom of Lesotho ***Project Manager***
2. 2014-2017 - Raising of the Clanwilliam Dam – Heritage Mitigation, Clanwilliam, Western Cape. ***Project Manager***
3. 2013 - Kappa Gamma, MSA Mitigation, Touws Rivier, Western Cape. ***Field Director, Dr M.M. van der Ryst, PI***
4. 2012 - Misgund N1 Interchange upgrade, Iron Age Phase 2 excavation, Johannesburg, Gauteng Province. ***Field Director, under Prof. JCA Boeyens, PI***
5. 2011 – Eskom 400kV – Dinaledi Spitskop – Phase 2 Historical Site, Mitigation - ***Field Director, J.P Behrens, PI***
6. 2011 – Eskom 400 kV – Dinaledi Marang – Phase 2 Middel Stone Age Site, Mitigation ***Field Director, Dr M.M. van der Ryst, PI***
7. 2011 – Eskom 400 kV – Dinaledi Marang – Phase 2 Late Iron Age, Mitigation - ***Field Director, under Prof. JCA Boeyens, PI***
8. 2011 – Eskom 400 kV – Dinaledi Marang – Phase 2 Early Stone Age Site, Mitigation - ***Field Director, under Dr K. Kumann, PI***
9. 2011 - Eskom 400kV – Dinaledi-Spitskop – Phase 2 Middel Stone Age Site, Mitigation - ***Field Director, under Dr M.M van der Ryst, PI***
10. 2009 - Nkomati Mine, Onverwacht Phase 2 excavations, Badplaas, Mpumalanga. ***Field Director, under Prof. TN Huffman, PI***
11. 2008 - TWP, Wesizwe Platinum Phase 2 excavations, Pilanesberg, North West Province. ***Field Director, under Prof. TN Huffman, PI***
12. 2008 - The Heads Trust, Heritage Assessment and phase 2 documentation, and monitoring for Lydenburg Ext 38 housing development, Lydenburg, Mpumalanga. ***Field Director, under Prof. JCA Boeyens, PI***
13. 2008 - Stonehenge x16, Phase 2 test excavations, Nelspruit, Mpumalanga. ***Field Director, under Prof. TN Huffman, PI***

14. 2007 - Phase 2 mitigation of archaeological terrain. Hammanskraal West Proper. Ditsala Construction. Hammanskraal, Gauteng Province. ***Field Director, under Prof. JCA Boeyens, PI***
15. 2007 - Phase 2 mitigation of archaeological terrain. Bokfontein Mining Project. Henric Ferrochrome, Brits North West Province. ***Field Director, under Prof. JCA Boeyens, PI***
16. 2006 - Phase 2 mitigation of archaeological terrain. Gardener Ross Golf and Country Estate. ***Field Director, under Prof. JCA Boeyens, PI***

POSITIONS HELD

- **2003 – current:** Director - PGS Heritage (Pty) Ltd
- **2006 – 2008:** Project Manager – Matakoma-ARM, Heritage Contracts Unit, University of the Witwatersrand
- **2005-2007:** Director – Matakoma Heritage Consultants (Pty) Ltd
- **2000-2004:** CEO– Matakoma Consultants
- **1998-2000:** Environmental Coordinator – Randfontein Estates Limited. Randfontein, Gauteng
- **1997-1998:** Environmental Officer – Department of Minerals and Energy. Johannesburg, Gauteng

CURRICULUM VITAE

Name	Andrea Gibb
Profession	Environmental Practitioner
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Divisional Manager Environmental Division
Years with Firm	8 Years
Date of Birth	29 January 1985
ID Number	8501290020089
Nationality	South African

Education

Matriculated 2003, Full Academic Colours, Northcliff High School, Johannesburg, South Africa

Professional Qualifications

BSc (Hons) Environmental Management (University of South Africa 2008-2010)

BSc Landscape Architecture (with distinction) (University of Pretoria 2004-2007)
<u>Awards:</u> Cave Klapwijk prize for highest average in all modules in the Landscape Architecture programme, ILASA book prize for the best Landscape Architecture student in third year design, Johan Barnard planting design prize for the highest distinction average in any module of plant science.

ArcGIS Desktop 1 (ESRI South Africa December 2010)
Environmental Impact Assessment (EIA) 2014 Legal Regime Workshop (Imbewu 2015)

Employment Record

Sept 2018 – to date	SiVEST SA (Pty) Ltd: Divisional Manager: Environmental Division
May 2017 – Aug 2018	SiVEST SA (Pty) Ltd: Senior Manager: Environmental Division
Aug 2010 – Apr 2017	SiVEST SA (Pty) Ltd: Environmental Practitioner
Jan 2008 – July 2010	Cave Klapwijk and Associates: Environmental Assistant and Landscape Architectural Technologist
Feb 2006 – Dec 2006	Cave Klapwijk and Associates: Part time student

Language Proficiency

LANGUAGE	SPEAK	READ	WRITE
English	Fluent	Fluent	Fluent

Key Experience

Andrea has over 10 years' work experience and is employed by SiVEST's Environmental Division as the Divisional Manager heading up the Renewable Energy Sector in the Johannesburg Office. She specialises in overseeing large scale multifaceted Environmental Impact Assessments (EIAs) and Basic Assessments (BAs) throughout South Africa, undertaken according to International Finance Corporation (IFC) standards and Equator Principles, within the renewable energy generation and electrical distribution sectors. From a business development perspective Andrea assists the division by marketing the environmental services and identifying prospective clients. She enjoys guiding, mentoring and motivating the team to find their niche and improve their input. Andrea further specialises in visual impact assessments (VIAs) and has developed a specialist team who she oversees.

Skills include:

- Project and team management
- Marketing and business development
- Financial management
- Client liaison and relationship management
- Team leadership
- Mentorship and training
- Report writing and review
- Documentation / quality control

Projects Experience

Aug 2010 – to date

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) / BASIC ASSESSMENT (BA)

- BA for the proposed construction of the Grasskoppies Substations and Power Line near Loeriesfontein, Northern Cape Province.
- BA for the proposed construction of the Ithemba Substations and Power Line near Loeriesfontein, Northern Cape Province.
- BA for the proposed construction of the Hartebeest Leegte Substations and Power Line near Loeriesfontein, Northern Cape Province.
- BA for the proposed construction of the !Xha Boom Substations and Power Line near Loeriesfontein, Northern Cape Province.
- EIA for the proposed construction of the Grasskoppies Wind Farm near Loeriesfontein, Northern Cape Province.
- EIA for the proposed construction of the Ithemba Wind Farm near Loeriesfontein, Northern Cape Province.
- EIA for the proposed construction of the Hartebeest Leegte Wind Farm near Loeriesfontein, Northern Cape Province.
- EIA for the proposed construction of the !Xha Boom Wind Farm near Loeriesfontein, Northern Cape Province.
- Application for an Amendment of the Environmental Authorisation (EA) for the proposed construction of the Droogfontein II PV Plant near Kimberley, Northern Cape Province.
- Amendment and Resubmission of the FBAR for the Eskom Longdown Substation and Vyeboom 66kV Turn-in Power Lines near Villiersdorp, Western Cape Province.
- BA for the proposed construction of the Leeuwbosch Power Plant near Leeudoringstad, North West Province.

- BA for the proposed construction of the Wildebeestkuil Power Plant near Leeudoringstad, North West Province.
- EIA for the proposed development of the Tlisitseng 1 and 2 75MW Solar Photovoltaic (PV) Energy Facilities near Lichtenburg, North West Province.
- EIAs for the proposed development of the Sendawo 1, 2, and 3 75MW Solar PV Energy Facilities near Vryburg, North West Province.
- EIA for the proposed construction of the Sendawo Common Collector Substation and power line near Vryburg, North West Province.
- EIA for the proposed construction of the Aletta 140MW Wind Energy Facility near Copperton, Northern Cape Province.
- Application for an Amendment of the Environmental Authorisation (EA) for the proposed construction of the 100MW Limestone Solar Thermal Power Project near Danielskuil, Northern Cape Province.
- Applications for the Amendment of the EAs for the proposed construction of three 75MW solar PV facilities near Prieska, Northern Cape Province.
- Applications for the Amendment of the EAs for the proposed construction of the 75MW Arriesfontein and Wilger Solar Power Plants near Danielskuil, Northern Cape Province.
- Completion and submission of the final EIA report for the proposed Rooipunt PV Solar Power Park Phase 1 and proposed Rooipunt PV Solar Power Park Phase 2 near Upington, Northern Cape Province.
- EIAs for the proposed construction of the Helena 1, 2 and 3 75MW Solar PV Energy Facilities near Copperton, Northern Cape Province.
- EIA for the proposed construction of the Nokukhanya 75MW Solar PV Power Plant near Dennilton, Limpopo Province.
- EIA for the proposed development of the Dwarsrug Wind Farm near Loeriesfontein, Northern Cape Province.
- BA for the proposed construction of two 132kV power lines and associated infrastructure from the Redstone Solar Thermal Power Project site to the Olien MTS near Lime Acres, Northern Cape Province.
- BA for the proposed construction of two 132kV power lines and associated infrastructure from Silverstreams DS to the Olien MTS near Lime Acres, Northern Cape Province.
- BA for the proposed Construction of the SSS1 5MW Solar PV Plant on the Western Part of Portion 6 (Portion of Portion 5) of Farm Spes Bona 2355 near Bloemfontein, Free State Province.
- BA for the proposed Construction of the SSS2 5MW Solar PV Plant on the Eastern Part of Portion 6 (Portion of Portion 5) of Farm Spes Bona 2355 near Bloemfontein, Free State Province.
- BA for the proposed Mookodi Integration Phase 2: Proposed Construction of a 132kV power line from the proposed Bophirima Substation to the existing Schweizer-Reneke Substation, North West Province.
- BA for the proposed Mookodi Integration Phase 2: Proposed Construction of a 132kV power line from the Mookodi Substation to the existing Magopela Substation, North West Province.
- BA for the proposed Mookodi Integration Phase 2: Proposed Construction of the Mookodi - Ganyesa 132kV power line, proposed Ganyesa Substation and Havelock LILO, North West Province.
- Amendment of the Final Environmental Impact Report for the Proposed Mookodi 1 Integration Project near Vryburg, North West Province.
- BA for the proposed 132kV power line and associated infrastructure for the proposed Redstone Solar Thermal Energy Plant near Lime Acres, Northern Cape Province.
- BA for the proposed construction of a 132kV power line and substation associated with the 75MW PV Plant on the Farm Droogfontein (PV 3) in Kimberley, Northern Cape Province.
- BA for the proposed establishment of a Learning and Development Retreat and an Executive Staff and Client Lodge at Mogale's Gate, Gauteng Province.
- Application for an Amendment of the EA to increase the output of the proposed 40MW PV Facility on the farm Mierdam to 75MW, Northern Cape Province.

- BA for the proposed construction of a power line and substation near Postmasburg, Northern Cape Province.
- BA for the proposed West Rand Strengthening Project – 400kV double circuit power line and substation extension in the West Rand, Gauteng.
- EIA for the proposed construction of a wind farm and PV plant near Prieska, Northern Cape Province.
- Public Participation assistance as part of the EIA for the proposed Thyspunt Transmission Lines Integration Project – EIA for the proposed construction of 5 x 400kV transmission power lines between Thyspunt to Port Elizabeth, Eastern Cape Province.
- EIA assistance for the proposed construction of three Solar Power Plants in the Northern Cape Province.
- Public Participation as part of the EIA for the proposed Delareyille Kopela Power Line and Substation, North West Province.
- Public Participation as part of the EIA for the Middelburg Water Reclamation Project, Mpumalanga Province.

VISUAL IMPACT ASSESSMENT (VIA)

- VIA for the proposed construction of the Mlonzi Golf Estate and Hotel Development, Eastern Cape Province.
- VIA for the proposed Tinley Manor South Banks Beach Enhancement Solution, KwaZulu-Natal Province.
- VIA for the proposed construction of the Grasskoppies Wind Farm near Loeriesfontein, Northern Cape Province.
- VIA for the proposed construction of the Ithemba Wind Farm near Loeriesfontein, Northern Cape Province.
- VIA for the proposed construction of the Hartebeest Leegte Wind Farm near Loeriesfontein, Northern Cape Province.
- VIA for the proposed construction of the !Xha Boom Wind Farm near Loeriesfontein, Northern Cape Province.
- VIA for the proposed Phezukomoya Wind Energy Facility near Noupoort, Northern Cape Province.
- VIA for the proposed San Kraal Wind Energy Facility near Noupoort, Northern Cape Province
- VIA for the proposed Assagay Valley Mixed Use Development, KwaZulu-Natal Province.
- VIA for the proposed Kassier Road North Mixed Use Development, KwaZulu-Natal Province.
- VIA for the proposed construction of a power line and associated infrastructure for the proposed Kalkaar Solar Thermal Power Plant near Kimberley, Free State and Northern Cape Provinces.
- VIA (Scoping Phase) for the proposed construction of a 3000MW Wind Farm and associated infrastructure near Richmond, Northern Cape Province.
- VIA for the proposed construction of the Aletta 140MW Wind Energy Facility near Copperton, Northern Cape Province.
- VIA for the proposed construction of a power line and associated infrastructure for the proposed Rooipunt Solar Thermal Power Plant near Upington, Northern Cape Province.
- VIAs (Impact Phase) for the proposed construction of the Sendawo 1, 2 and 3 solar PV energy facilities near Vryburg, North West Province.
- VIA (Impact Phase) for the proposed construction of the Sendawo substation and associated power line near Vryburg, North West Province.
- VIAs (Impact Phase) for the proposed construction of the Tlisitseng 1 and 2 solar PV energy facilities near Lichtenburg, North West Province.
- VIA for the proposed construction of the Tlisitseng substation and associated 132kV power line near Lichtenburg, North West Province.
- VIA (Scoping Phase) for the proposed construction of the Sendawo substation and associated power line near Vryburg, North West Province.
- VIA (Scoping Phase) for the proposed construction of the Sendawo 1, 2 and 3 solar PV energy facilities near Vryburg, North West Province.

- VIA (Scoping Phase) for the proposed construction of the Tlisitseng 1 and 2 solar PV energy facilities near Lichtenburg, North West Province.
- Visual recommendations for Phase 1 of the proposed Renishaw Estate Mixed Use Development, KwaZulu-Natal Province.
- VIA for the proposed Tinley Manor South Banks Development, KwaZulu-Natal Province.
- VIAs (Impact Phase) for the proposed construction of the Helena 1, 2 and 3 75MW Solar PV Energy Facilities near Copperton, Northern Cape Province.
- VIA (Scoping Phase) for the proposed construction of the Helena 1, 2 and 3 75MW Solar PV Energy Facilities near Copperton, Northern Cape Province.
- Visual Due Diligence Report for the possible rapid rail extensions to the Gauteng network, Gauteng Province.
- Visual Status Quo and Constraints Report for the possible rapid rail extensions to the Gauteng network, Gauteng Province.
- VIA for the proposed agricultural components of the Integrated Sugar Project in Nsoko, Swaziland.
- VIA for the proposed Tweespruit to Welroux power lines and substation, Free State Province.
- VIA for the proposed construction of the Nokukhanya 75MW Solar PV Power Plant near Dennilton, Limpopo Province.
- VIA (Impact Phase) for the proposed development of the Dwarsrug Wind Farm near Loeriesfontein, Northern Cape Province.
- VIA for the proposed amendment to the authorised power line route from Hera Substation to Westgate Substation, Gauteng Province.
- VIA (Impact Phase) for the Eastside Junction Mixed Use Development near Delmas, Mpumalanga Province.
- VIA for the proposed construction of two 132kV power lines and associated infrastructure from the Redstone Solar Thermal Power Project site to the Olien MTS near Lime Acres, Northern Cape Province.
- VIA for the proposed construction of two 132kV power lines and associated infrastructure from Silverstreams DS to the Olien MTS near Lime Acres, Northern Cape Province.
- VIA (Scoping Phase) for the proposed development of the Dwarsrug Wind Farm near Loeriesfontein, Northern Cape Province.
- VIA for the proposed Rorqual Estate Development near Park Rynie on the South Coast of KwaZulu Natal.
- VIA (Scoping Phase) for the proposed construction of a Coal-fired Power Station, Coal Mine and Associated Infrastructure near Colenso, KwaZulu-Natal Province.
- VIA for the proposed Mookodi Integration Phase 2: Proposed Construction of the Mookodi - Ganyesa 132kV power line, proposed Ganyesa Substation and Havelock LILO, North West Province.
- VIA for the proposed construction of the Duma transmission substation and associated Eskom power lines, KwaZulu-Natal Province.
- VIA for the proposed construction of the Madlanzini transmission substation and associated Eskom power lines, Mpumalanga Province.
- VIA for the proposed rebuild of the 88kV power line from Normandie substation to Hlungwane substation, Mpumalanga and KwaZulu-Natal Provinces.
- VIA for the proposed construction of the Nzalo transmission substation and associated Eskom power lines, KwaZulu-Natal Province.
- VIA for the proposed construction of the Sheepmoor traction substation with two 20MVA transformer bays and a new associated 88kV turn-in power line, Mpumalanga Province.
- VIA for the proposed rebuild of the 88kV power line from Uitkoms substation to Antra T-off, Mpumalanga Province.
- VIA for the proposed rebuild of the 88kV power line from Umfolozi substation to Eqwasha traction substation including an 88kV turn-in power line to Dabula traction substation, Kwazulu-Natal Province.
- VIA for the proposed construction of the new 88/25kV Vryheid traction substation with two 20MVA transforma bays and a new associated 88kV turn-in power line, KwaZulu-Natal Province.

- VIA for the proposed construction of a 132kV power line and substation associated with the 75MW PV Plant on the Farm Droogfontein (PV 3) in Kimberley, Northern Cape Province.
- VIA (Impact Phase) for the proposed Construction of a Solar PV Power Plant near De Aar, Northern Cape Province.
- VIA for the (Impact Phase) proposed Construction of the Renosterberg Wind Farm near De Aar, Northern Cape Province.
- VIA for the (Impact Phase) proposed Construction of the Renosterberg Solar PV Power Plant near De Aar, Northern Cape Province.
- VIA for the proposed construction of a 132kV power line for the Redstone Thermal Energy Plant near Lime Acres, Northern Cape Province.
- VIA for the proposed Mookodi Integration phase 2 132kV power lines and Ganyesa substation near Vryburg, North West Province.
- VIA for the proposed 132kV power lines associated with the PV Plants on Droogfontein Farm near Kimberley, Northern Cape Province.
- VIA (Scoping phase) for the Eastside Junction Mixed Use Development near Delmas, Mpumalanga Province.
- VIA for the proposed development of a learning and development retreat and an executive and staff lodge at Mogale's Gate, Gauteng Province.
- VIA for the proposed construction of a substation and 88kV power line between Heilbron (via Frankfort) and Villiers, Free State Province.
- Visual Status Quo Assessment for the Moloto Development Corridor Feasibility Study in the Gauteng Province, Limpopo Province and Mpumalanga Province.
- VIA the West Rand Strengthening Project – 400kV double circuit power line and substation extension in the West Rand, Gauteng.
- VIA for the proposed construction of a wind farm and solar photovoltaic plant near Loeriesfontein, Northern Cape Province.
- Visual sensitivity mapping exercise for the proposed Mogale's Gate Expansion, Gauteng.
- VIA (Scoping Phase) for the proposed Renosterberg Solar PV Power Plant and Wind Farm near De Aar, Northern Cape Province.
- Scoping level VIAs for the proposed construction of three Solar Power Plants in the Northern Cape Province.
- VIAs for the Spoornet Coallink Powerline Projects in KZN and Mpumalanga.
- Visual Constraints Analysis for the proposed establishment of four Wind Farms in the Eastern and Northern Cape Province.
- VIA (Scoping Phase) for the proposed development of a solar energy facility in De Aar, Northern Cape.
- VIA (Scoping Phase) for the proposed development of a solar energy facility in Kimberley, Northern Cape.

STRATEGIC ENVIRONMENTAL PLANNING

- Assistance with the Draft Environmental Management Framework for the Mogale City Local Municipality, Gauteng Province.
- Sensitivity Negative Mapping Analysis for the proposed Mogale's Gate Development, Gauteng Province.

CURRICULUM VITAE

Dr. David Barry Hoare

B.Sc. (Hons), M.Sc., Ph.D., Pr.Nat.Sci. (Ecology, Botany)

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Cell: 083 284 5111
E-mail: dhoare@lantic.net

Personal information

Date of birth: 04 November 1966, Grahamstown, South Africa
Citizenship: Republic of South Africa
ID no.: 661104 5024 088

Education

Matric - Graeme College, Grahamstown, 1984
B.Sc (majors: Botany, Zoology) - Rhodes University, 1991-1993
B.Sc (Hons) (Botany) - Rhodes University, 1994 with distinction
M.Sc (Botany) - University of Pretoria, 1995-1997 with distinction
PhD (Botany) – Nelson Mandela Metropolitan University, Port Elizabeth

Main areas of specialisation

- Vegetation ecology, primarily in grasslands, thicket, coastal systems, wetlands.
- Plant biodiversity and threatened plant species specialist.
- Alien plant identification and control / management plans.
- Remote sensing, analysis and mapping of vegetation.
- Specialist consultant for environmental management projects.

Membership

Professional Natural Scientist, South African Council for Natural Scientific Professions, 16 August 2005 – present. Reg. no. 400221/05 (Ecology, Botany)
Member, International Association of Vegetation Scientists (IAVS)
Member, Ecological Society of America (ESA)
Member, International Association for Impact Assessment (IAIA)
Member, Herpetological Association of Africa (HAA)

Employment history

1 December 2004 – present, Director, David Hoare Consulting (Pty) Ltd. Consultant, specialist consultant contracted to various companies and organisations.
1January 2009 – 30 June 2009, Lecturer, University of Pretoria, Botany Dept.
1January 2013 – 30 June 2013, Lecturer, University of Pretoria, Botany Dept.
1 February 1998 – 30 November 2004, Researcher, Agricultural Research Council, Range and Forage Institute, Private Bag X05, Lynn East, 0039. Duties: project management, general vegetation ecology, remote sensing image processing.

Experience as consultant

Ecological consultant since 1995. Author of over 380 specialist ecological consulting reports. Wide experience in ecological studies within grassland, savanna and fynbos, as well as riparian, coastal and wetland vegetation.

Publication record:

Refereed scientific articles (in chronological order):

Journal articles:

HOARE, D.B. & BREDENKAMP, G.J. 1999. Grassland communities of the Amatola / Winterberg mountain region of the Eastern Cape, South Africa. *South African Journal of Botany* 64: 44-61.

HOARE, D.B., VICTOR, J.E., LUBKE, R.A. & MUCINA, L., 2000. Vegetation of the coastal fynbos and rocky headlands south of George, South Africa. *Bothalia* 30: 87-96.

VICTOR, J.E., HOARE, D.B. & LUBKE, R.A., 2000. Checklist of plant species of the coastal fynbos and rocky headlands south of George, South Africa. *Bothalia* 30: 97-101.

MUCINA, L, BREDENKAMP, G.J., HOARE, D.B & MCDONALD, D.J. 2000. A National Vegetation Database for South Africa *South African Journal of Science* 96: 1-2.

HOARE, D.B. & BREDENKAMP, G.J. 2001. Syntaxonomy and environmental gradients of the grasslands of the Stormberg / Drakensberg mountain region of the Eastern Cape, South Africa.. *South African Journal of Botany* 67: 595 – 608.

LUBKE, R.A., HOARE, D.B., VICTOR, J.E. & KETELAAR, R. 2003. The vegetation of the habitat of the Brenton blue butterfly, Orachrysops niobe (Trimen), in the Western Cape, South Africa. *South African Journal of Science* 99: 201–206.

HOARE, D.B & FROST, P. 2004. Phenological classification of natural vegetation in southern Africa using AVHRR vegetation index data. *Applied Vegetation Science* 7: 19-28.

FOX, S.C., HOFFMANN, M.T. and HOARE, D. 2005. The phenological pattern of vegetation in Namaqualand, South Africa and its climatic correlates using NOAA-AVHRR NDVI data. South African Geographic Journal, 87: 85–94.

PFAB, M.F., COMPAAN, P.C., WHITTINGTON-JONES, C.A., ENGELBRECHT, I., DUMALISILE, L., MILLS, L., WEST, S.D., MULLER, P., MASTERSON, G.P.R., NEVHUTALU, L.S., HOLNESS, S.D., HOARE, D.B. 2017. The Gauteng Conservation Plan: Planning for biodiversity in a rapidly urbanising province. Bothalia, Vol. 47:1. a2182. https://doi.org/10.4102/abc.v47i1.2182.

Book chapters and conference proceedings:

HOARE, D.B. 2002. Biodiversity and performance of grassland ecosystems in communal and commercial farming systems in South Africa. Proceedings of the FAO's Biodiversity and Ecosystem Approach in Agriculture, Forestry and Fisheries Event: 12–13 October, 2002. Food and Agriculture Organisation of the United Nations, Viale delle Terme di Caracalla, Rome, Italy. pp. 10 - 27.

STEENKAMP, Y., VAN WYK, A.E., VICTOR, J.E., HOARE, D.B., DOLD, A.P., SMITH, G.F. & COWLING, R.M. 2005. Maputaland-Pondoland-Albany Hotspot. In: Mittermeier, R.A., Gil, P.R., Hoffmann, M., Pilgrim, J., Brooks, T., Mittermeier, C.G., Lamoreux, J. & Fonseca, G.A.B. da (eds.) *Hotspots revisited.* CEMEX, pp.218–229. ISBN 968-6397-77-9

STEENKAMP, Y., VAN WYK, A.E., VICTOR, J.E., HOARE, D.B., DOLD, A.P., SMITH, G.F. & COWLING, R.M. 2005. Maputaland-Pondoland-Albany Hotspot. http://www.biodiversityhotspots.org/xp/hotspots/maputaland/.

HOARE, D.B., MUCINA, L., RUTHERFORD, M.C., VLOK, J., EUSTON-BROWN, D., PALMER, A.R., POWRIE, L.W., LECHMERE-OERTEL, R.G., PROCHES, S.M., DOLD, T. and WARD, R.A. *Albany Thickets.* in Mucina, L. and Rutherford, M.C. (eds.) 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19, South African National Biodiversity Institute, Pretoria.

MUCINA, L., HOARE, D.B., LÖTTER, M.C., DU PREEZ, P.J., RUTHERFORD, M.C., SCOTT-SHAW, C.R., BREDENKAMP, G.J., POWRIE, L.W., SCOTT, L., CAMP, K.G.T., CILLIERS, S.S., BEZUIDENHOUT, H., MOSTERT, T.H., SIEBERT, S.J., WINTER, P.J.D., BURROWS, J.E., DOBSON, L., WARD, R.A., STALMANS, M., OLIVER, E.G.H., SIEBERT, F., SCHMIDT, E., KOBISI, K., KOSE, L. 2006. *Grassland Biome.* In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

RUTHERFORD, M.C., MUCINA, L., LÖTTER, M.C., BREDENKAMP, G.J., SMIT, J.H.L., SCOTT-SHAW, C.R., HOARE, D.B., GOODMAN, P.S., BEZUIDENHOUT, H., SCOTT, L. & ELLIS, F., POWRIE, L.W., SIEBERT, F., MOSTERT, T.H., HENNING, B.J., VENTER, C.E., CAMP, K.G.T., SIEBERT, S.J., MATTHEWS, W.S., BURROWS, J.E., DOBSON, L., VAN ROOYEN, N., SCHMIDT, E., WINTER, P.J.D., DU PREEZ, P.J., WARD, R.A., WILLIAMSON, S. and HURTER, P.J.H. 2006. *Savanna Biome.* In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

MUCINA, L., RUTHERFORD, M.C., PALMER, A.R., MILTON, S.J., SCOTT, L., VAN DER MERWE, B., HOARE, D.B., BEZUIDENHOUT, H., VLOK, J.H.J., EUSTON-BROWN, D.I.W., POWRIE, L.W. & DOLD, A.P.

2006. *Nama-Karoo Biome.* In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

MUCINA, L., SCOTT-SHAW, C.R., RUTHERFORD, M.C., CAMP, K.G.T., MATTHEWS, W.S., POWRIE, L.W. and HOARE, D.B. 2006. *Indian Ocean Coastal Belt.* In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

Conference Presentations:

HOARE, D.B. & LUBKE, R.A. *Management effects on diversity at Goukamma Nature Reserve, Southern Cape*; Paper presentation, Fynbos Forum, Bienne Donne, July 1994

HOARE, D.B., VICTOR, J.E. & LUBKE, R.A. *Description of the coastal fynbos south of George, southern Cape*; Paper presentation, Fynbos Forum, Bienne Donne, July 1994

HOARE, D.B. & LUBKE, R.A. *Management effects on fynbos diversity at Goukamma Nature Reserve, Southern Cape*; Paper presentation, South African Association of Botanists Annual Congress, Bloemfontein, January 1995

HOARE, D.B. & BOTHA, C.E.J. *Anatomy and ecophysiology of the dunegrass Ehrharta villosa var. maxima*; Poster presentation, South African Association of Botanists Annual Congress, Bloemfontein, January 1995

HOARE, D.B., PALMER, A.R. & BREDENKAMP, G.J. 1996. *Modelling grassland community distributions in the Eastern Cape using annual rainfall and elevation*; Poster presentation, South African Association of Botanists Annual Congress, Stellenbosch, January 1996

HOARE, D.B. *Modelling vegetation on a past climate as a test for palaeonological hypotheses on vegetation distributions*; Paper presentation, Randse Afriakaanse Universiteit postgraduate symposium, 1997

HOARE, D.B., VICTOR, J.E. & BREDENKAMP, G.J. *Historical and ecological links between grassy fynbos and afromontane fynbos in the Eastern Cape*; Paper presentation, South African Association of Botanists Annual Congress, Cape Town, January 1998

LUBKE, R.A., HOARE, D.B., VICTOR, J.E. & KETELAAR, R. *The habitat of the Brenton Blue Butterfly*. Paper presentation, South African Association of Botanists Annual Congress, Cape Town, January 1998

HOARE, D.B. & PANAGOS, M.D. Satellite stratification of vegetation – structure or floristic composition? Poster presentation at the 34th Annual Congress of the Grassland Society of South Africa, Warmbaths, 1-4 February 1999.

HOARE, D.B. & WESSELS, K. Conservation status and threats to grasslands of the northern regions of South Africa, Poster presentation at the South African Association of Botanists Annual Congress, Potchefstroom, January 2000.

HOARE, D.B. Phenological dynamics of Eastern Cape vegetation. Oral paper presentation at the South African Association of Botanists Annual Congress, Grahamstown, January 2002.

HOARE, D.B., MUCINA, L., VAN DER MERWE, J.P.H. & PALMER, A.R. Classification and digital mapping of grasslands of the Eastern Cape Poster presentation at the South African Association of Botanists Annual Congress, Grahamstown, January 2002.

HOARE, D.B. Deriving phenological variables for Eastern Cape vegetation using satellite data Poster presentation at the South African Association of Botanists Annual Congress, Grahamstown, January 2002.

MUCINA, L., RUTHERFORD, M.C., HOARE, D.B. & POWRIE, L.W. 2003. VegMap: The new vegetation map of South Africa, Lesotho and Swaziland. In: Pedrotti, F. (ed.) Abstracts: Water Resources and Vegetation, 46th Symposium of the International Association for Vegetation Science, June 8 to 14 – Napoli, Italy.

HOARE, D.B. 2003. Species diversity patterns in moist temperate grasslands of South Africa. Proceedings of the VIIth International Rangeland Congress, 26 July – 1 August 2003, Durban South Africa. African Journal of Range and Forage Science. 20: 84.

Unpublished technical reports:

PALMER, A.R., HOARE, D.B. & HINTSA, M.D., 1999. Using satellite imagery to map veld condition in Mpumalanga: A preliminary report. Report to the National Department of Agriculture (Directorate Resource Conservation). ARC Range and Forage Institute, Grahamstown.

HOARE, D.B. 1999. The classification and mapping of the savanna biome of South Africa: methodology for mapping the vegetation communities of the South African savanna at a scale of 1:250 000. Report to the National Department of Agriculture (Directorate Resource Conservation). ARC Range and Forage Institute, Pretoria.

HOARE, D.B. 1999. The classification and mapping of the savanna biome of South Africa: size and coverage of field data that exists on the database of vegetation data for South African savanna. Report to the National Department of Agriculture (Directorate Resource Conservation). ARC Range and Forage Institute, Pretoria.

THOMPSON, M.W., VAN DEN BERG, H.M., NEWBY, T.S. & HOARE, D.B. 2001. Guideline procedures for national land-cover mapping and change monitoring. Report no. ENV/P/C 2001-006 produced for Department of Water Affairs and Forestry, National Department of Agriculture and Department of Environment Affairs and Tourism. Copyright: Council for Scientific and Industrial Research (CSIR) and Agricultural Research Council (ARC).

HOARE, D.B. 2003. Natural resource survey of node O R Tambo, using remote sensing techniques, Unpublished report and database of field data for ARC Institute for Soil, Climate & Water, ARC Range and Forage Institute, Grahamstown.

HOARE, D.B. 2003. Short-term changes in vegetation of Suikerbosrand Nature Reserve, South Africa, on the basis of resampled vegetation sites. Gauteng Department of Agriculture, Conservation, Environment and Land Affairs, Conservation Division.

BRITTON, D., SILBERBAUER, L., ROBERTSON, H., LUBKE, R., HOARE, D., VICTOR, J., EDGE, D. & BALL, J. 1997. The Life-history, ecology and conservation of the Brenton Blue Butterfly (*Orachrysops niobe*) (Trimen)(*Lycaenidea*) at Brenton-on-Sea. Unpublished report for the Endangered Wildlife Trust of Southern Africa, Johannesburg. 38pp.

HOARE, D.B., VICTOR, J.E. & MARNEWIC, G. 2005. Vegetation and flora of the wetlands of Nylsvley River catchment as component of a project to develop a framework for the sustainable management of wetlands in Limpopo Province.

Consulting reports:

Total of over 380 specialist consulting reports for various environmental projects from 1995 – present.

Workshops / symposia attended:

International Association for Impact Assessment Annual Congress, Durban, 16 – 19 May 2018.

Workshop on remote sensing of rangelands presented by Paul Tueller, University of Nevada Reno, USA, VIIth International Rangeland Congress, 26 July – 1 August 2003, Durban South Africa.

VIIth International Rangeland Congress, 26 July – 1 August 2003, Durban South Africa.

BioMap workshop, Stellenbosch, March 2002 to develop strategies for studying vegetation dynamics of Namaqualand using remote sensing techniques

South African Association of Botanists Annual Congress, Grahamstown, January 2002.

28th International Symposium on Remote Sensing of Environment, Somerset West, 27-31 March 2000.

Workshop on Vegetation Structural Characterisation: Tree Cover, Height and Biomass, 28th International Symposium on Remote Sensing of Environment, Strand, 26 March 2000.

South African Association of Botanists Annual Congress, Potchefstroom, January 2000

National Botanical Institute Vegmap Workshop, Kirstenbosch, Cape Town, 30 September-1 October 1999.

Sustainable Land Management – Guidelines for Impact Monitoring, Orientation Workshop: Sharing Impact Monitoring Experience, Zithabiseni, 27-29 September 1999.

WWF Macro Economic Reforms and Sustainable Development in Southern Africa, Environmental Economic Training Workshop, development Bank, Midrand, 13-14 September 1999.

34th Annual Congress of the Grassland Society of South Africa, Warmbaths, 1-4 February 1999

Expert Workshop on National Indicators of Environmental Sustainable Development, Dept. of Environmental Affairs and Tourism, Roodevallei Country Lodge, Roodeplaat Dam, Pretoria, 20-21 October 1998.

South African Association of Botanists Annual Congress, Cape Town, January 1998

Randse Afriakaanse Universiteit postgraduate symposium, 1997.

South African Association of Botanists Annual Congress, Bloemfontein, January 1995.

Referees:

Prof. Roy Lubke, Associate Professor Emeritus, Botany Department, Rhodes University, Grahamstown Tel: 0461-318 592. E-mail: r.lubke@ru.ac.za

Prof. Richard Cowling, Botany Department, Nelson Mandela Metropolitan University, Tel (042) 298 0259 E-mail: rmc@kingsley.co.za

Michele Pfab, Scientific Co-ordinator: Scientific Authority, Applied Biodiversity Research, South African National Biodiversity Institute, (012) 843 5025, E-mail: M.Pfab@sanbi.org.za

MARKO HUTTEN

Professional Archaeologist

Name:	Marko Hutten
Profession:	Archaeologist
Date of birth:	1971-06-24
Parent Firm:	PGS Heritage Pty Ltd
Position at Firm:	Freelance Archaeologist
Years with firm:	9
Years of experience:	20
Nationality:	South African
HDI Status:	White Male

EDUCATION:

Name of University or Institution	: University of Pretoria
Degree obtained	: BA
Major subjects	: Archaeology & Anthropology
Year	: 1996

Name of University or Institution	: University of Pretoria
Degree obtained	: BA [Hons]
Major subjects	: Archaeology
Year	: 1997

Professional Qualifications:

Professional Archaeologist - Association of Southern African Professional Archaeologists - Professional Member CRM Accreditation:

• Field Director - Iron Age

• Field Director - Grave Relocation

Languages:

Afrikaans – First language

English – Speaking (Good) Reading (Good), Writing (Good)

KEY QUALIFICATIONS

Archaeological mitigation and excavations, Social consultation on grave relocation projects, Cultural Resource Management and Heritage Impact Assessment Management, Historical and Archival Research, Archaeology, Anthropology, Applicable survey methods, Fieldwork and project management.

EXPERIENCE

Archaeological Impact Assessments

1998 – 2016

Performed 300+ Archaeological Impact Assessments (1st phase). Clients include:

- Vodacom
- Telkom
- Eskom
- Roads Agency of Limpopo (RAL)
- Department of Water Affairs and Forestry (DWAF)

- South African National Parks (SANParks)
- Impala Platinum
- Various Environmental Impact Assessment Companies such as: Naledzi Environmental Consultants; Tekplan Environmental; Lokisa Environmental Consulting

Grave Relocation Projects:

- Nandoni Dam Grave Relocation Project, ± 1000 graves, 2000/01 (Field Director)
- Tavistock Colliery Grave Relocation Project, ± 700 graves, 2002 (Field Director)
- Marula Platinum Grave Rescue Project, x 2 graves, 2003 (Field Director)
- Silverlakes Grave Relocation Project, x 5 graves, 2005 (Field Director)
- Bela-Bela (Outpost) Grave Relocation Project, x 80 graves, 2008 (Field Director)
- Potgieters Rus Platinum Mine Grave Relocation Project, x 16 graves, 2008 (Field Director)
- New Vaal Colliery Grave Relocation Project, x 1700 graves, 2007 (Field Director)
- Shakadza Road Upgrade Grave Rescue Project, x 1 grave, 2007 (Field Director)
- Mapungubwe Grave Repatriation Project 2007 (Field Supervisor)
- Atcom Colliery Grave Relocation project, x200 graves 2008-2009 (Field Director)
- Nkomati Mine Grave Relocation project, 100 graves 2009-2010 (Field Director)
- Tweefontein Optimization Grave Relocation Project, 800 graves. 2014-current (Field Director)

Second Phase Investigations/Excavations *(Including Site Stabilization and Rehabilitation):*

- Nandoni Dam Archaeological Project 1998 (Field Supervisor)
- Nandoni Dam Archaeological Project 1998 – 1999 (Field Director)
- Mapungubwe Rehabilitation Project 2003 (Field Director)
- Schroda Rehabilitation Project 2006 (Field Director)
- K2 Rehabilitation Project 2006 (Field Director)
- Mapungubwe Rehabilitation Project 2006 (Field Director)

- Shakadza Rescue and Rehabilitation Project 2007 (Field Director)
- Clanwilliam Dam Mitigation Project, 2014-currnet – Site Manager

2008-2013

Archaeological Impact Assessments (1st phase) *(Projects in conjunction with, in brackets):*

- Premier Mine Heritage Survey 2008 (PGS)
- Gope Transmission Line Survey 2008 (Botswana– Archaeology Africa)
- Argent Siding Heritage Survey 2008 (Archaeology Africa)
- Morgenzon Pipe Line Heritage Survey 2008 (Archaeology Africa)
- Klipfontein Heritage Survey 2008 (PGS)
- Spitzkop Mine Heritage Survey 2008 (PGS)
- Elandsfontein Heritage Survey 2008 (PGS)
- Makobe Township Heritage Survey 2008
- Tswinga Township Heritage Survey 2008
- Mankweng Borrow Pits Heritage Survey 2008
- Knapdaar Heritage Survey 2008 (PGS)
- Hotazel Heritage Survey 2008 (PGS)
- Lisbon Township Heritage Survey 2009
- Koert Louw Heritage Survey 2009 (PGS)
- Knapdaar Heritage Survey 2009 (PGS)
- De Wittekrans Heritage Survey 2009 (PGS)
- Ga-Kgapane Township Heritage Survey 2009
- Guernsey Eco-estate Heritage Survey 2009
- De Deur Heritage Survey 2009 (PGS)
- Bultfontein Heritage Survey 2009 (PGS)

- Optimum Mine Heritage Survey 2009
- Gorkum Eco-Estate Heritage Survey 2009
- Planknek Pipe line Heritage Survey 2009
- Regorogile Ext. 9 Heritage Survey 2009
- Haddon Agricultural Heritage Survey 2009
- Jansenpark Residential Development Heritage Survey 2009
- Klein Kariba Residential Development Heritage Survey 2009
- Kangala Mine Heritage Survey 2009 (PGS)
- Hoedspruit Juice Factory Heritage Survey 2009
- Kameelfontein Heritage Survey 2009 (PGS)
- Leolo Township Heritage Survey 2010
- Rietpol Agricultural Development Heritage Survey 2010
- Lwamondo Mining Heritage Survey 2010
- Vanderbijlpark Heritage Survey 2010 (PGS)
- Kongoni Mine Heritage Survey 2010 (PGS)
- Lehating Mine Heritage Survey 2010 (PGS)
- Donkerpoort Township Heritage Survey 2010
- Klerksdorp Township Heritage Survey 2010 (PGS)
- Boikarabelo Heritage Survey 2010 (PGS)
- Mountain View Township Heritage Survey 2010
- De Put Township Heritage Survey 2010
- Vygeboomfontein Eco-Estate Heritage Survey 2010
- Vuyani-Neptune Power Line Heritage Survey 2010 (PGS)
- Gamma-Kappa Power Line Heritage Survey 2010 (PGS)
- Olifants River Bridge Heritage Survey 2010

- Bon Accord Mine Heritage Survey 2010 (PGS)
- Olifants River Water Scheme Heritage Survey 2010 (PGS)
- Buffelskloof Mine Heritage Survey 2010 (Gem-Science)
- Vlakvarkfontein Mine Heritage Survey 2010 (Gem-Science)
- Spitskop Solar Park Heritage Survey 2011
- Geluksfontein farm Heritage Survey 2011
- Leeuwvallei Town Development Heritage Survey 2011
- De Aar Solar Park Heritage Survey 2011 (PGS)
- Onbekend Mine Heritage Survey 2011 (Gem-Science)
- Witkop Solar Park Heritage Survey 2011
- Bel-Bela Solar Park Heritage Survey 2011
- Delta Solar Park Heritage Survey 2011
- Madibeng Pipe Line Heritage Survey 2011 (PGS)
- Soutpan Solar Park Heritage Survey 2011
- Vlakvarkfontein Mine Heritage Survey 2011 (PGS)
- Vuwani & Valdezia Pipe Lines Heritage Survey 2011

Grave Relocation Projects:

- Zondagsvlei Grave Relocation Project, x 110 graves, 2008 (PGS: Field Director)
- Garstfontein Road Grave Relocation Project, x 15 graves, 2008 (PGS: Field Director)
- Gautrain Grave Relocation Project, x 40 graves, 2008 (PGS: Field Director)
- Zwavelpoort Grave Relocation Project, x 45 graves, 2009 (PGS: Field Director)
- Motaganeng Grave Relocation Project, x 60 graves, 2009 (PGS: Field Director)
- Smokey Hills Platinum Mine Grave Relocation Project, x 10 graves, 2009 (PGS: Field Director)
- Klein Kopje Colliery Grave Relocation Project, x 4 graves, 2009 (PGS: Field Director)

- Lefapa Grave Relocation Project, x 8 graves, 2009 (PGS: Field Director)
- New Clydesdale Colliery Grave Relocation Project, x 7 graves, 2010 (PGS: Field Director)
- Osizwini Grave Relocation Project, x 73 graves, 2010 (PGS: Field Director)
- Straffontein (New Largo Colliery) Grave Relocation Project, x 16 graves, 2010 (PGS: Field Director)
- ATCOM Colliery Grave Relocation Project, x 80 graves, 2010 (PGS: Field Director)
- Welgelegen Mine Grave Relocation Project, x 7 graves, 2010 (PGS: Field Director)
- Ferreiras (Mashala) Grave Relocation Project, x 11 graves, 2011 (PGS: Field Director)

Second Phase Investigations/Excavations:

- Onverwacht Archaeological Project 2008 (Archaeology Africa: Field Supervisor)
- Nandoni Dam Archaeological Project 1998 (Field Supervisor)
- Nandoni Dam Archaeological Project 1998 – 1999 (Field Director)
- Mapungubwe Rehabilitation Project 2003 (Field Director)
- Schroda Rehabilitation Project 2006 (Field Director)
- K2 Rehabilitation Project 2006 (Field Director)
- Mapungubwe Rehabilitation Project 2006 (Field Director)
- Shakadza Rescue and Rehabilitation Project 2007 (Field Director)
- Clanwilliam Dam Mitigation Project, 2014-currnet – Site Manager

EMPLOYMENT SUMMARY

2014/09/01 – Current

Hutten Heritage Consultants: Director/Archaeologist

2013/08/01 – Current

PGS Heritage: Archaeologist

2008 - 2013

Hutten Heritage Consultants: Director/Archaeologist

1998 – 2008

Archaeo-Info Northern Province, (AINP): Director/Archaeologist

1995 – 1997

University of Pretoria (Dept. of Anatomy): Technical Assistant

Countries of work experience:

- South Africa
- Botswana

Mozambique

CURRICULUM VITAE

Name	Stephan Hendrik Jacobs
Profession	Environmentalist
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Environmental Consultant
Years with Firm	3 years
Date of Birth	28 May 1991
ID Number	9105285065080
Nationality	South African

Education

Pretoria Boys High, Pretoria, South Africa, Matriculated 2009.

Professional Qualification

- B.Sc. Hons Environmental Management and Analysis, (Post Graduate) University Of Pretoria Honours (2014).
- B.Sc. Environmental Sciences (Undergraduate) University Of Pretoria (2012-2013)

Employment Record

May 2015 – current	SiVEST SA (Pty) Ltd – Graduate Environmental Consultant
Nov 2014 – Feb 2015	Sodwana Bay Fishing Charters – Assistant Manager
Oct 2014 – Mar 2015	Ufudu Turtle Tours – Tour Guide

Language Proficiency

LANGUAGE	SPEAK	READ	WRITE
English	Excellent	Excellent	Excellent
Afrikaans	Good	Good	Good

Key Experience

Stephan joined SiVEST in May 2015 and holds the position of Environmental Consultant in the Johannesburg office.

Stephan specialises in the field of Environmental Management and has been extensively involved in Environmental Impact Assessment (EIA) and Basic Assessment (BA) processes for various types of projects / developments. As such, Stephan has vast experience with regards to the compilation of Environmental Impact Assessments (EIAs) and Basic Assessments (BAs). Additionally, Stephan has extensive experience in undertaking public participation and stakeholder engagement processes. Stephan has also assisted extensively in the undertaking of field work and the compilation of reports for specialist studies such as Surface Water and Visual Impact Assessments. Stephan also has experience in Environmental Compliance and Auditing and has acted as an Environmental Control Officer (ECO) for several infrastructure projects.

Stephan has been educated and achieved his degrees (B.Sc. and B.Sc. Hons) at the University of Pretoria in Environmental Sciences (Environmental Management & Analysis).

Skills include:

- Strong computer skills (Work, excel, PowerPoint etc.);
- Strong Proposal and report writing skills;
- Report compilation skills for Environmental Impact Assessments (EIAs) and Basic Assessments (BAs);
- Report compilation skills for Environmental Management Plans/Programmes (EMPr);
- Compilation and conducting Visual Impact Assessments;
- Assisting in Surface Water / Wetland Delineations and Assessments.

Key experience includes:

- Environmental Impact Assessment (EIA) of small, medium and large-scale infrastructure projects,
- Basic Assessment (BA), of small, medium and large-scale infrastructure projects,
- Environmental Management Plans (EMPr), of small, medium and large-scale infrastructure projects,
- Undertaking of Public Participation and Stakeholder Engagement Processes
- Proposal and tender compilation,
- Environmental Compliance and Auditing (ECO);
- Various site inspections, and
- Visual Impact Assessments (Field work and report compilation).

Projects Experience

Stephan is responsible for the following activities: report writing, proposal writing, assisting in specialist surface water delineation and functional assessments, assisting in visual impact assessments and environmental compliance and auditing procedures. Current and completed projects / activities are outlined in detail below:

- Environmental Control Officer (ECO) for the Polokwane Integrated Rapid Public Transport System (IRPTS), Limpopo Province.

- Basic Assessment (BA) for the construction of a Non-Motorised Transport (NMT) Training and Recreational Park adjacent to the Peter Mokaba Stadium in Polokwane, Limpopo Province.

- Basic Assessment (BA) for the Proposed Expansion of the Tissue Manufacturing Capacity at the Twinsaver Kliprivier Operations Base, Gauteng Province.

- Basic Assessment (BA) for the Proposed Construction of a New SPAR Distribution Centre on Erf 1092 at Redhouse in Port Elizabeth, Eastern Cape Province.

- Basic Assessment (BA) for the Proposed Construction of the Graskoppies Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.

- Basic Assessment (BA) for the Proposed Construction of the Hartebeest Leegte Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.

- Basic Assessment (BA) for the Proposed Construction of the Ithemba Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.

- Basic Assessment (BA) for the Proposed Construction of the !Xha Boom Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province

- Environmental Impact Assessment (EIA) for the Proposed Construction of the Graskoppies Wind Farm near Loeriefontein, Northern Cape Province.

- Environmental Impact Assessment (EIA) for the Proposed Construction of the Hartebeest Leegte Wind Farm near Loeriefontein, Northern Cape Province.
- Environmental Impact Assessment (EIA) for the Proposed Construction of the Ithemba Wind Farm near Loeriefontein, Northern Cape Province.
- Environmental Impact Assessment (EIA) for the Proposed Construction of the !Xha Boom Wind Farm near Loeriefontein, Northern Cape Province.
- Environmental Control Officer (ECO) for Phase 1 and Phase 2 of the Newmarket Retail Development, Gauteng Province.
- Environmental Control Officer (ECO) for the proposed NuPay Office Block development at the Newmarket Retail Development, Gauteng Province.
- Environmental Control Officer (ECO) for the proposed Construction of the Decathlon Building at the Newmarket Retail Development, Gauteng Province.
- Environmental Control Officer (ECO) for the External Road Upgrades at the Newmarket Retail Development, Gauteng Province.
- Environmental Review of the Xakwa Coal Operations, adjacent to the proposed Eastside Junction Development.
- Environmental Due Diligence for the Woodlands and Harrowdene Office Parks in Woodmead, Gauteng Province.
- Visual Impact Assessment for the Helena Solar PV Plant, Northern Cape Province.
- Visual Impact Assessment for the Nsoko Msele Integrated Sugar Project, Swaziland.
- Visual Impact Assessments for the proposed construction of the Sendawo Solar 1, Sendawo Solar 2 and Sendawo Solar 3 Photovoltaic (PV) Energy Facilities near Vryburg, North West Province.
- Visual Impact Assessments for the proposed construction of the Sendawo Substation and Associated 400kV Power Line near Vryburg, North West Province.
- Visual Impact Assessments for the proposed construction of the Tlisitseng Solar 1 and Tlisitseng Solar 2 Photovoltaic (PV) Energy Facilities near Lichtenburg, North West Province.
- Visual Impact Assessment for the proposed construction of the Tlisitseng 1 132kV Substation and associated 132kV Power Line near Lichtenburg, North West Province.
- Visual Impact Assessment for the proposed construction of the Tlisitseng 2 132kV Substation and associated 132kV Power Line near Lichtenburg, North West Province.
- Visual Impact Assessment for the proposed construction of the 3000MW PhilCo Green Energy Wind Farm and Associated Infrastructure near Richmond, Northern Cape Province.
- Visual Impact Assessment for the proposed construction of the Aletta 140MW Wind Energy Facility neat Copperton, Northern Cape Province.
- Visual Impact Assessment for the proposed construction of the Aletta 132kV Substation and associated 132kV Power Line near Copperton, Northern Cape Province.

- Visual Impact Assessment for the proposed construction of the Eureka 140MW Wind Energy Facility and associated Infrastructure near Copperton, Northern Cape Province.
- Visual Impact Assessment for the proposed construction of the Eureka 400kV Substation and 400kV Power Line neat Copperton, Northern Cape Province.
- Visual Impact Assessment for the Proposed Construction of the Graskoppies Wind Farm near Loeriesfontein, Northern Cape Province.
- Basic Visual Impact Assessment for the Proposed Construction of the Graskoppies Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.
- Visual Impact Assessment for the Proposed Construction of the Hartebeest Leegte Wind Farm near Loeriesfontein, Northern Cape Province.
- Basic Visual Impact Assessment for the Proposed Construction of the Hartebeest Leegte Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.
- Visual Impact Assessment for the Proposed Construction of the Ithemba Wind Farm near Loeriesfontein, Northern Cape Province.
- Basic Visual Impact Assessment for the Proposed Construction of the Ithemba Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.
- Visual Impact Assessment for the Proposed Construction of the !Xha Boom Wind Farm near Loeriesfontein, Northern Cape Province.
- Basic Visual Impact Assessment for the Proposed Construction of the !Xha Boom Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.
- Visual Impact Assessment for the Proposed Construction of the 315MW Phezukomoya Wind Energy Facility near Noupoort, Northern Cape Province.
- Visual Impact Assessment for the Proposed Construction of the 390MW Sankraal Wind Energy Facility near Noupoort, Northern Cape Province.
- Visual Impact Assessment for the proposed development of the Phase 1 Kuruman Wind Energy Facility, Kuruman, Northern Cape Province
- Visual Impact Assessment for the proposed development of the Phase 2 Kuruman Wind Energy Facility, Kuruman, Northern Cape Province
- Basic Visual Impact Assessment for the proposed development of Supporting Electrical Infrastructure to the Phase 1 and Phase 2 Kuruman Wind Energy Facilities, Kuruman, Northern Cape Province
- Visual Impact Assessment for the Proposed Tinley Manor South Banks Beach Enhancement Solution, KwaZulu-Natal Province.
- Visual Impact Assessment for the proposed Mlonzi Hotel and Golf Estate Development, Near Lusikisiki, Eastern Cape Province

- Visual Impact Assessment for the Proposed Assagay Valley Development, KwaZulu-Natal Province.
- Visual Impact Assessment for the Proposed Kassier Road North Development, KwaZulu-Natal Province.
- Basic Visual Impact Assessment for the proposed construction of up to a 132kV Power Line and Associated Infrastructure for the Rooipunt Solar Thermal Power Plant near Upington, Northern Cape Province.
- Basic Visual Impact Assessment for the proposed construction of up to a 132kV Power Line and Associated Infrastructure for the proposed Kalkaar Solar Thermal Power Plant near Kimberly, Free State and Northern Cape Provinces.
- Surface Water Assessment for the Steve Thswete Local Municipality, Mpumalanga Province.
- Surface Water Delineation and Assessment for the proposed coal Railway Siding at the Welgedacht Marshalling Yard and associated Milner Road Upgrade near Springs, Ekurhuleni Metropolitan Municipality.

JG AFRIKA
EXPERIENCE QUALITY INTEGRITY

CURRICULUM VITAE

ADRIAN WESLEY NATHANIEL JOHNSON

Profession	*Technologist*
Position in Firm	*Senior Technologist*
Area of Specialisation	*Highway*
Qualifications	*PrTechEng, BSc (Hons) (Applied Science: Transport Planning), BTech Civil Engineering*
Years of Experience	*13 Years*
Years with Firm	*2 Year*

SUMMARY OF EXPERIENCE

Adrian Johnson is a Professional Technologist registered with ECSA (201570274). He joined JG Afrika (Pty)Ltd. in January 2017. Adrian holds a BSc(Hons) (Applied Sciences: Transportation Planning) degree from the University of Pretoria and a BTech degree in Civil Engineering from the Cape Peninsula University of Technology. He has more than 13 years of experience in a wide range of engineering projects.

He has technical and professional skills in traffic impact studies, public transport planning, non-motorised transport planning & design, data analysis of public transport systems, access management plans, quality control, project planning and implementation, geometric design, site supervision, transport assessments for renewable energy projects and road safety audits.

PROFESSIONAL REGISTRATIONS & INSTITUTE MEMBERSHIPS

PrTechEng - Engineering Council of South Africa, Registration No 201570274

EDUCATION

2004 - National Diploma (Civil) – Peninsula Technikon
2006 - BTech (Civil) – Cape Peninsula University of Technology
2011 - BSc (Hon) (Applied Sciences: Transportation Planning) – University of Pretoria

SPECIFIC EXPERIENCE

JG Afrika (Pty) Ltd (Previously Jeffares & Green (Pty) Ltd)

2017 – Date
Position – Senior Technologist (Traffic and Transportation Engineering)

Road Safety Audit for N2 Wild Coast Toll Road Projects, Eastern Cape & Natal, Client: Aurecon/Knight Piesold on behalf of SANRAL

Traffic Risk Assessment for Kuruman Wind Energy Facility, Northern Cape. Client: CSIR

Parking Audit of the Groenvallei area in Bellville – Client: City of Cape Town

Road Safety Appraisals for the Mpumalanga Province – Client: Mpumalanga Provincial Government

Transportation and Traffic Management Plan for the proposed Coega West Wind Energy Facility in Port Elizabeth – Client: Electrawinds Coega (Pty) Ltd

Road Safety Appraisals for North Region of Cape Town – Client: Aurecon on behalf of City of Cape Town (TCT)

Speed Limit Reviews for North Region of Cape Town – Client: Aurecon on behalf of City of Cape Town (TCT)

Road Safety Audit for the Upgrade of N1 Section 4 Monument River – Client: Aurecon on behalf of SANRAL

Road Safety Audit for the Upgrade of N2 Section 8 Knysna to Wittedrift – Client: SMEC on behalf of SANRAL

Road Safety Audit for the Upgrade of N1 Section 16 Zandkraal to Winburg South – Client: SMEC on behalf of SANRAL

Traffic and Road Safety Studies for the Improvement of N7 Section 2 and Section 3 (Rooidraai and Piekenierskloofpass) – Client: SANRAL

Traffic Engineering Services for the Enkanini Informal Settlement, Kayamandi - Client: Stellenbosch Municipality

Traffic Engineer for the Upgrade of a 150km Section of the National Route N2 from Kangela to Pongola in KwaZulu-Natal, Client: SANRAL

GIBB (Pty) Ltd

2014 – 2016
Position – Technologist / Project Leader (Traffic and Transportation Engineering)

Operational Support to the MyCiTi Integrated Rapid Transit System - Tasks included analysis of AFC data, generating monthly operations reports, analysis of passenger surveys, journey time runs, travel time surveys, compilation of a MyCiTi Festive Season Report and compilation of reports for the Century City and V&A Waterfront stakeholders. Client: Transport for Cape Town.

Technical Support to the MyCiTi Business Planning Department - A detailed route-by-route analysis, during peak and off-peak conditions to generate daily demand profiles, with a focus on identifying inefficiencies.
Additional tasks included:

- An assessment of profitability of routes based on patronage, revenue and operating costs;
- Analysis of AFC data;
- Comparison between the manual survey results and the Transportation Reporting System (TRS) data;
- Analysis of the Free Token Card Promotion;

- Route and bus optimisation;
- Station and feeder stop utilization and
- Assessment of Parking Tariffs for Managed Parking Bays within the City of Cape Town.

Client: Transport for Cape Town.

AFC Data Analysis - Data Analysis of AFC Data of the City of Tshwane's A Re Yeng Bus Service. Client: Development Bank of Southern Africa.

Ghana Transport Statues Quo Study - Transport Status Quo Study for the Greater Accra Regional Spatial Development Framework. Client: Government of Ghana: Ministry of Lands & Natural Resources.

Botswana TIA – Transport Impact Assessment for the Mogoditshane- Kanye Road project in Botswana. Client: Republic of Botswana's Ministry of Transport and Communications: Roads Department.

Botswana Access Management Plan Transport Impact Assessment for the Mogoditshane- Kanye Road project in Botswana. Client: Republic of Botswana's Ministry of Transport and Communications: Roads Department.

MyCiTi SystemPlanning - Rationalisation of the GABS bus routes within the City of Cape Town. Client: Transport for Cape Town.

Road Safety Master Plan - Compilation of a Road Safety Master Plan for Stellenbosch Municipality. Client: Stellenbosch Municipality.

Constantia TIS - Transport Impact Statement and Parking Motivation for the proposed redevelopment of Erf 2134, Constantia. Client: High Constantia Properties.

Top Yard TIA - Transport Impact Assessment for the Government Garage Precinct Plan (Top Yard). Client: PricewaterhouseCoopers (PWC).

Boschendal TIA - Transport Impact Assessment for the development of Boschendal Village. Client: Boschendal (Pty)Ltd.

Vergenoegd TIA - Transport Impact Assessment for the development of Portion 19 of Farm 653, Vergenoegd. Client: Headland Planners.

Tygerberg Hospital Traffic Status Quo Study - Traffic Status Quo Study for the Development Framework for the Tygerberg Hospital Site in Bellville. Client: City Think Space.

Eerste River TIA - Transport Impact Assessment for Erf 5541, Eerste River. Client: Headland Planners

BVi Consulting Engineers

2013– 2014
Position – Technologist (Transportation Engineering)

Waaihoek Wind Energy Facility TIA - Transport Impact Assessment for the proposed construction of a Wind Energy Facility on Waaihoek Farm near Utrecht Town in Kwazulu-Natal. Client: Mainstream

Renewable Power.

Sere Wind Farm - Supervision of Bell Mouth Widening's & Other Modifications along route B1, 2 And 3 from Saldanha Port to Sere Wind Farm near Koekenaap. Client: Siemens.

Slip lane Design for Windhoek Service Station - Geometric design of a slip lane to the existing Windhoek Fuel Centre, Windhoek, Namibia. Client: Multi Consult.

Lafarge Industries

2011– 2013
Position – Quality Controller

Responsible for the quality control at four ReadyMix concrete plants and the Tygerberg Quarry.

- Design of new concrete mixes and optimisation of existing mix designs.
- Assist client with technical matters and problem solving.
- Compile technical reports.
- Motivate, train and develop staff to ensure growth and succession.
- Arrange and monitor staff schedules.
- Conduct Quality training for field technicians, reps and batchers.
- Statistical analysis of concrete results and monitoring product performance.

Aurecon Mozambique

2010– 2011
Position – Roadworks Engineer (Site Supervision)

Mozambique site supervision - Roadworks Engineer responsible for inspection of works and monitoring workmanship for the Construction of a 135km road from Montepuez to Ruaca in Northern Mozambique. Client: Administracao Nacional De Estradas (Mozambican Roads Authority)

Aurecon South Africa

2004– 2010
Position – Technician/Technologist (Traffic and Transportation Engineering)

Kewtown site supervision - Resident Engineer for the Community Residential Units Programme Pilot Project in Kewtown. Client: City of Cape Town.

N2 road design - Vertical and horizontal alignment of the N2 from Coega to Colchester. Client: SANRAL.

Western Cape Provincial Weighbridges -Resident Engineer on various projects involving the upgrading and expansion of the 9 Provincial Weighbridges in the Western Cape. Client: Provincial Administration: Western Cape.

Traffic and Transport tasks - Various traffic counts, traffic data analysis and transport impact statements. Client: Various.

CONTINUED PROFESSIONAL DEVELOPMENT

Courses

2007 - SAICE Flood estimation and Storm Water Drainage for Roads Course

2008 - Certificate in Project Management

2009 - SAICE Practical Geometric Design Course

2011 - C&CI Concrete Technology

2013 - Post graduate Courses – Financial Management and Asset Management
AutoCAD Civil 3D Training

2014 - Leadership Training -Project Risk Training and Anti- Corruption and Integrity Management
Post graduate Courses – Strategic Operations Management and Project Management

2015 - Leadership Training – Report Writing

2016 - Leadership Training - Quality Management and Time Management

2017 - Road Safety Auditor Course (SARF)

2018 - Road Safety in Engineering (SARF)

PERSONAL DETAILS

Nationality – South African
Date of Birth – 1984-05-31
Domicile – Cape Town, South Africa

Languages
English – Very Good
Afrikaans – Good

Johann Lanz
Curriculum Vitae

Education

• M.Sc. (Environmental Geochemistry)	University of Cape Town	1996 - June 1997
• B.Sc. Agriculture (Soil Science, Chemistry)	University of Stellenbosch	1992 - 1995
• BA (English, Environmental & Geographical Science)	University of Cape Town	1989 - 1991
• Matric Exemption	Wynberg Boy's High School	1983

Professional work experience

I am registered as a Professional Natural Scientist (Pri.Sci.Nat.) in the field of soil science, registration number 400268/12.

- **Soil Science Consultant** **Self employed** **2002 - present**

  I run a soil science consulting business, servicing clients in both the environmental and agricultural industries. Typical consulting projects involve:
- Soil specialist study inputs to EIA's, SEA's and EMPR's. These have focused on impact assessments and rehabilitation on agricultural land, rehabilitation and re-vegetation of mining and industrially disturbed and contaminated soils, as well as more general aspects of soil resource management. Recent clients include: CSIR; SRK Consulting; Aurecon; Mainstream Renewable Power; SiVEST; Savannah Environmental; Subsolar; Red Cap Investments; MBB Consulting Engineers; Enviroworks; Sharples Environmental Services; Haw & Inglis; BioTherm Energy; Tiptrans.
- Soil resource evaluations and mapping for agricultural land use planning and management. Recent clients include: Cederberg Wines; Unit for Technical Assistance - Western Cape Department of Agriculture; Wedderwill Estate; Goedgedacht Olives; Zewenwacht Wine Estate, Lourensford Fruit Company; Kaarsten Boerdery; Thelema Mountain Vineyards; Rudera Wines; Flagstone Wines; Solms Delta Wines; Dornier Wines.
- I have conducted several research projects focused on conservation farming, soil health and carbon sequestration.

- **Soil Science Consultant** **Agricultural Consultors International (Tinie du Preez)** **1998 - end 2001**

  Responsible for providing all aspects of a soil science technical consulting service directly to clients in the wine, fruit and environmental industries all over South Africa, and in Chile, South America.

- **Contracting Soil Scientist** **De Beers Namaqualand Mines** **July 1997 - Jan 1998**

  Completed a contract to make recommendations on soil rehabilitation and re-vegetation of mined areas.

Publications

- Lanz, J. 2012. Soil health: sustaining Stellenbosch's roots. In: M Swilling, B Sebitosi & R Loots (eds). *Sustainable Stellenbosch: opening dialogues*. Stellenbosch: SunMedia.
- Lanz, J. 2010. Soil health indicators: physical and chemical. *South African Fruit Journal*, April / May 2010 issue.
- Lanz, J. 2009. Soil health constraints. *South African Fruit Journal*, August / September 2009 issue.
- Lanz, J. 2009. Soil carbon research. *AgriProbe*, Department of Agriculture.
- Lanz, J. 2005. Special Report: Soils and wine quality. *Wineland Magazine.*

I am a reviewing scientist for the *South African Journal of Plant and Soil*.

—— MIGUEL MASCARENHAS ——

+351 212 951 588 | miguel.m@bioinsight.pt | www.bioinsight.pt

Profile

Miguel Mascarenhas is a Manager and an Ecological Environmental specialist that likes challenges, innovation and be a solution designer. As a consequence, at Bioinsight, Miguel assumes the role of business developer focused on leading a highly motivated team that also loves to be challenged, whether by complex project or the development of disruptive solutions.

Experience:

16 years | 657 proj.

Worked in countries:

- Portugal
- Mozambique

Projects for countries:

- South Africa
- Cape Verde
- Mexico
- Mozambique
- Poland
- Portugal

Skills

Corporate management
●●●●●

Environmental Impact
●●●●○

Ecology
●●●●○

+ Employment

CHAIRMAN OF THE BOARD | BIODINÂMICA, MOZAMBIQUE
Since 2017

SENIOR CONSULTANT | BIO3 LDA., PORTUGAL
2012 - 2016

CEO AND BUSINESS DEVELOPMENT DIRECTOR | BIO3 LDA., PORTUGAL
2011 - 2012

CEO | BIOINSIGHT (BIO3), PORTUGAL
Since 2011

CEO | BIO3 LDA., PORTUGAL
2005 - 2011

CEO | BIO3 LDA., PORTUGAL
2005 - 2013

FREELANCER | SEVERAL COMPANIES SUCH AS DHVFBO, ENERPRO, PROCESL E PGG, PORTUGAL
2003 - 2005

RESEARCHER | LABORATÓRIO DE BIOLOGIA CELULAR - INSTITUTO DE BIOLOGIA EXPERIMENTAL E TECNOLÓGICA, PORTUGAL
2002 - 2003

+ Education

MSC IN BUSINESS MANAGEMENT (EQF LEVEL 7)
INDEG Business School, Portugal
2011 - 2013

POS-GRADUATION IN GEOGRAPHIC INFORMATION SYSTEMS
Higher Institute of Agronomy, Portugal
2006 - 2006

MSC IN ENVIRONMENTAL IMPACT ASSESSMENT (EQF LEVEL 7)
Institute of Ecology Investigation of Málaga, Spain
2003 - 2004

GRADUATION IN APPLIED PLANTS BIOLOGY (EQF LEVEL 6)
Sciences Faculty of the University of Lisbon, Portugal
1995 - 2001

+ Projects

Bioinsight group projects

2018	Nature Conservation	Ecological Component of the Environmental Incidence Assessment of na Aviary in Évora, Portugal. Portugal.
2018	Electric sector	Ecological Component of the Environmental Incidence Assessmen of an Execution Project for the Eletrification of the section Marco de Canaveses - Régua da Linha do Douro, Portugal. Portugal.
2018	Nature Conservation	Characterization of Flora and Vegetation of a Rural Hotel in Herdade da Comporta. Portugal.
2018	Wind Energy	Ecological Component of the Environmental Impact Assessmen of Arrimal's Wind Farm, Portugal. Portugal.
2018	Wind Energy	Annual Monitoring Study of Birds and Bats (daytime and nightime) in 2018 in the Park and in the Eletric Line of Bii Stinu Wind Farm (EDI), Oaxaca, Mexico. Mexico.
2018	Oil & Gas	Ecological Monitoring of the Construction of the Replacement Village (RV) Ecological Monitoring of a Replacement Village Project associated to the development of a Liquefied Natural Gas Project of Anadarko Moçambique Area 1 Limitada (AMA 1) in Palma. Mozambique.
2018	Mining	Ecological Component of the Environmental Impact Assessmen of an Mining Instalation enlargement in Aljustrel, Portugal. Portugal.
2018	Land Management	Ecological and climate componente of a Special Program for Ribeiradio-Ermida Dam, Portugal. Portugal.
2018	Electric sector	Environmental and Social Impact Assessment (ESIA) of a 220kV interconnection between Metoro - Palma (Mozambique). Mozambique.
2018	Electric Sector	Ecological Component of the Environmental Impact Assessmen of a substation of an Electric Energy Transformation - Tabaqueira, Portugal. Portugal.
2018	Wind Energy	Environmental Report for legal framework application to the Portuguese Evironmental Authorithy (APA) on the Overcapacity Equipment in Archeira Wind Farm. Portugal.
2018	Wind Energy	Wind farm of Terreiro das Bruxas - Environmental report containing the legal framework as request from the Portuguese Environmental Authority (APA). Portugal.
2018	Animal Production	EIA Ecological Component of a Cattle Exploitation Project in Portel. Portugal.
2018	Animal Production	Ecology Component of the Environmental Impact Study of the Poultry Facility in S. João das Lampas, Portugal. Portugal.
2018	Wind Energy	Birds and Bats monitoring in the Torcha II Wind Farm - Year 0 (pre-construction). Portugal.
2018	Hydric Energy	Ecological component of the Environmental Impact Assessment study of the small hydro of Abrantes, Martinchel and Cascata do Zêzere, Portugal.. Portugal.
2018	Water Treatment	Ecological Component of RECAPE of the Sewage treatment of Funchal , Portugal.. Portugal.
2018	Transports	Ecological Component of the Environmental Studies of the Road Network - Variant to the Cemetery - EN 115-4,Portugal.. Portugal.
2018	Hydric Energy	Monitoring of Terrestrial Fauna of the Foz Tua Hydroelectric Deployment - Construction Phase Balance Report. Portugal.
2018	Solar energy	Componente Ecológica do Estudo de Impacte Ambiental de 2 Centrais Solares em Salvaterra de Magos,Portugal.. Portugal.
2018	Wind Energy	Detailed Report of the Environmental Programs for 5 Wind Farms, Rio Grande do Norte state, Brazil. .
2018	Wind Energy	Support to the implementation of the Iberwind Environmental Management System to obtain ISO 14001 Certification. Portugal.
2018	Urban	Monitoring of aquatic birds at Loures Riverside Pathway. Portugal.
2018	Maritime	Water Quality and Biological Communities monitoring in the area of internvetion of the Ria Formosa's Hydrodynamic Valorisation and Risk Mitigation of the barrier islands - Post-Dredging phase. Portugal.
2018	Tourism	Scientific expeditions. Portugal.
2018	Solar Energy	Faunal Impact Assessment for 3 proposed Solar Energy Facilities: Heuningklip, Doornfontein & Kruispad. South Africa.
2018	Wind Energy	Update of Avifaunal Specialist Reports for Boulders Wind Energy Farm. South Africa.
2018	Wind Energy	Juno Wind Energy Farm - Additional for Bat Report Updates. South Africa.
2018	Wind Energy	Diamond Wind Energy Farm Bird and Bat Data Validity, Monitoring and Impact Assessment Reports for Basic Assessment Process. South Africa.
2018	Wind Energy	Kudusberg Wind Energy Farm Bird and Bat Specialist Studies for Basic Assessment Process. South Africa.
2018	Wind Energy	Bird and Bat Pre-Construction Campaign at Rondekop Wind Energy Facility. South Africa.
2017	Mining	Active monitoring of vegetation, foreseen in the Environmental Management Plan for the operation of the Moatize Coal Mine, Tete. Mozambique.

2017	Animal Production	Addendum to the project "Technical prescription for the Assessment, Management and Monitoring of High Conservation Values (HCV)": Production of cartographic information for HCV 1, 2, 3 and 4 for the new Portucel DUAT areas of Zambézia. Mozambique.
2017	Solar Energy	Ecological Section of the Environmental Impact Study of a Solar Power Plant in Ourique. Portugal.
2017	Electric sector	Bird Monitoring at Ponte de Lima - Vila Nova Famalicão powerline (400kV). Portugal.
2017	Electric sector	Bird Monitoring at the powerlines of Estremoz-Divor, Vieira do Minho - Pedralva 2, Recarei - Vila Nova de Famalicão, Vermoim - Vila Nova de Famalicão. Portugal.
2017	Wind Energy	Bird and Bat Monitoring at Chavães and Sendim Wind Farms' and associated powerline (operation phase - 3rd year). Poland.
2017	Nature Conservation	Design of the Management Plan of Agolada's and Monte da Barca's Dams. Portugal.
2017	Electric sector	Ecological Section of the Environmental Impact Study and Preliminary Environmental Compliance Report study of the Beira Alta's Powerline - Modernization Project of Pampilhosa-Mangualde powerline. Portugal.
2017	Tourism	Ecological Section of the Environmental Impact Study of Praia Campsite. Portugal.
2017	Tourism	Ecological Section of the Environmental Impact Study of a Land subdivision for a Tourist Resort located in Herdade da Mata do Rei (Sesimbra). Portugal.
2017	Land Management	Characterization of the natural values (Nature Conservation - fauna, flora, biodiversity) and Strategic Environmental Assessment aiming the Revision of Arronches Municipal Director Plan. Portugal.
2017	Wind Energy	Bat monitoring at Três Marcos and Douro Sul's Wind Farms. Portugal.
2017	Wind Energy	Flora and Vegetation Monitoring and invasive flora species' control at Três Marcos and Douro Sul's Wind Farms. Portugal.
2017	Nature Conservation	Monitoring of the State of Water Masses, Rivers and Reservoirs - RHS (River Habitat Survey) component, Portugal . Portugal.
2017	Nature conservation	Design and installation of an Interpretive Center - Iberian Wolf - in Vinhais in partnership with the City Council. Portugal.
2017	Tourism	Implementation of an Environmental Awareness Program and Promotion of Nature Tourism in Vinhais, in partnership with the City Council, Portugal - Sector Promotion of Conservation Tourism. Portugal.
2017	Urban	Pigeons Population Control in Caldas da Rainha's City, Portugal. Portugal.
2017	Wind Energy	Bird and Bat Monitoring of the expansion area of Caramulo's Wind Farm (pre-construction). Portugal.
2017	Wind Energy	Bird and Bat Monitoring of the expansion area of Gardunha's Wind Farm (pre-construction). Portugal.
2017	Roads	Ecological Section of the Environmental Impact Study of the En103 road - Vinhais/Bragança, Portugal. Portugal.
2017	Wind Energy	Update of the Ecological Section of Malhadas' Wind Farm Environmental Impact Study, Portugal . Portugal.
2017	Hydric Energy	Ecological Monitoring of the Calheta's Dam Expansion Project (Pre-Construction Phase), Portugal. Portugal.
2017	Industry	Ecological Section of the Environmental Impact Study of na aviary at Terceira Island -Azores, Portugal. Portugal.
2017	Wind Energy	Pandion halietus e Falco alexandri Collision Risk Analysis, at Boa Vista Wind Farm. Cape Verde.
2017	Wind Energy	Flora and Vegetation monitoring of the expansion area of Gardunhas', Caramulo and Pinhal Interior Wind Farms - Year 0, Portugal. Portugal.
2017	Wind Energy	Flora and Vegetation monitoring of the expansion area of Gardunhas', Caramulo and Pinhal Interior Wind Farms - Year 0, Portugal. Portugal.
2017	Wind Energy	Flora and Vegetation monitoring of the expansion area of Gardunhas', Caramulo and Pinhal Interior Wind Farms - Year 0, Portugal. Portugal.
2017	Wind Energy	Ecological Section of the expansion area monitoring at Malhadas' Wind Farm - Year 0, Portugal. Portugal.
2017	Maritime	Water Bird Monitoring aiming the "Hydrodynamic valorization and risk mitigation of the Armona sea wall to reinforce the dune strand in Barril beach and Cavacos beach" (pre operation phase), Portugal. Portugal.
2017	Hydric Energy	Monitoring of the effectiveness and optimization of the watergates of Borland Crestuma-Lever, Carrapatelo and Régua - 12K Compensatory Measure - Increase of the Douro Fluvial Connectivity, Portugal. Portugal.
2017	Electric Sector	Environmental Impact Study and Preliminary Environmental Compliance Report in the Ecological Section of Feira - Ribeira da Pena powerline (400kV) and in its expansion area, Portugal. Portugal.
2017	Electric Sector	Flora Monitoring Plan of Ponte de Lima - Vila Nova de Famalicão powerline (400kV), Portugal. Portugal.
2017	Electric Sector	Ecological Component of the Reference Situation for a High Voltage Power Line and Substation, in Almada, Portugal. Portugal.
2017	Offshore Aquaculture	Ecological Section of the Environmental Impact Assessment of an Offshore Fish Farm Expansion in Madeira, Portugal. Portugal.
2017	Wind Energy	Bird, Bat and Flora Monitoring at Arrimal's Wind Farm (Year 0), Portugal. Portugal.
2017	Airports	Bird Monitoring at Francisco Sá Carneiro's Airport and surrounding area, Portugal . Portugal.
2017	Nature Conservation	Water Quality and Biological Communities Monitoring of the project area "Hydrodynamic valorization and risk mitigation of the Armona sea wall to reinforce the dune strand in Barril beach and Cavacos beach",

		Portugal. Portugal.
2017	Urban	Design of the Habitat Management Plan for IKEA Loulé. Portugal.
2017	Wind Energy	Flora Monitoring at S. Macario's Wind Farm, Portugal. Portugal.
2017	Urban	Ecological Section of the Environmental Studies of the "EN229 - IP5 / Mundão Business Park" Execution Project. Portugal.
2017	Maritime	Non-permanent monitoring by a specialized biologist of the misalignment in Mira Bar with transposition of Coast Sediments, Portugal. Portugal.
2017	Industry	Ecological Component of EINCA for the expansion of an industrial waste management unit in Batalha, Portugal. Portugal.
2017	Aquaculture	Environmental Evaluation of a Microalgae Prodution project, Portugal. Portugal.
2017	Urban	Ecological Section of the Enviromental Impact Study of the Execution Plan for a Pedestrian and Cyclable Course on the Frente Ribeirinha in Loures, Portugal. Portugal.
2017	Nature Conservation	Arachnofauna Inventory in Areas Under Management of Parques de Sintra - Monte da Lua. Portugal.
2017	Maritime/ Ports	Ecological Section of the Enviromental Impact Study of the Modernization Project in Alcântara Container Terminal, Portugal. Portugal.
2017	Oil & Gas	Enviromental Impact Study of the Onshore Natural Gas Surveys in concessions of Batalha and Pombal, Portugal. Portugal.
2017	Hydric Energy	Non ecological Section of PIMA - Exploration phase in Foz Tua. Portugal.
2017	Animal Production	Ecological Section of the Enviromental Impact Study of the Regulation Project and Licencing of a livestock in Ponte de Sor, Portugal. Portugal.
2017	Wind Energy	Ecological Monitoring: Birds carcass removal tests in LMAT Palmela-Évora, Portugal. Portugal.
2017	Tourism	Ecological Component of the Environmental Impact Assessmen of the Aldeia das Cegonhas Tourist Village. Portugal.
2017	Electric sector	Ecological Component of the Environmental Incidence Assessmen of "Linha do Alentejo - Troço Poceirão-Bombel e Bifurcação de Águas de Moura Sul" - elimination of constraints, Portugal. Portugal.
2016	Forestry	Portucel Forest Project in Zambézia: Technical prescription for the Assessment, Management and Monitoring of High Conservation Values (HCV), according to the FSC Principles and Criteria. Mozambique.
2016	Wind Energy	Iberian wolf monitoring at Serra de Bornes Wind Farm (construction phase), Portugal. Portugal.
2016	Wind Energy	Bird and Bat Carcass search monitoring at Alto do Marco's Wind Farm (operation phase - 2016). Portugal.
2016	Wind Energy	Technical Advisory in environmental licensing of wind farms in sensitive areas. Portugal.
2016	Wind Energy	Flora and vegetation monitoring at Picos - Vale do Chão Wind Farm and powerline (operation phase). Portugal.
2016	Wind Energy	Bird Monitoring at Serra dos Candeeiros' Wind Farm. Portugal.
2016	Wind Energy	Ecological Management Advisory on the Environmental Impact Assessment (EIA) and post-EIA of Wind Farms. Portugal.
2016	Animal Production	Ecological Section of AvePark's Environmental Impact Assessment Study. Portugal.
2016	Wind Energy	Bird and Bat Monitoring at Caramulo's Wind Farm. Portugal.
2016	Wind Energy	Implementation of an invasive flora species (Acacia sp.) management plan at Pampilhosa da Serra Wind Farm (operation phase - continuation), Portugal. Portugal.
2016	Wind Energy	Implementation of an invasive flora species (Acacia sp.) Management Plan at Lousã I Wind Farm (operation phase - continuation), Portugal. Portugal.
2016	Wind Energy	Bird, Bat, Flora and Vegetation monitoring at Lousã II Wind Farm and its expansion area (operation phase). Portugal.
2016	Electric sector	Design and implementation of the bird monitoring plan at six 220 kV and 400 kV power lines at Lagoaça-Macedo de Cavaleiros crossing the International Douro Natural Park (continuation). Portugal.
2016	Hydric Energy	Ecological Section of the Preliminary Environmental Compliance Report study Of Calheta's Dam Expansion Project, Portugal. Portugal.
2016	Oil & Gas	Cabrera's vole (Microtus cabrerae) monitoring under the Preliminary Environmental Compliance Report study Celorico-Vale de Frades' Gas pipeline. Portugal.
2016	Electric sector	Bird monitoring at the power intensification station of Salamonde II, Venda Nova III and Vieira do Minho. Portugal.
2016	Wind Energy	Bird, Bat and Iberian Wolf Monitoring at Lomba da Seixa and Cabeço Alto and Wind Farm (Year 0) and Montalegre's Wind Farm (operation phase, year 1). Portugal.
2016	Wind Energy	Bird, Bat, Flora, Vegetation and Iberian Wolf Monitoring at the expansion area of Bornes' Wind Farm (operation phase). Portugal.
2016	Wind Energy	Bird and Bat Monitoring at Chão Falcão II & III Wind Farm and associated expansion areas (operation phase). Portugal.
2016	Animal Production	Ecological Section of the Environmental Impact Study of an existing Cattle Fattening infrastructure. Portugal.
2016	Animal	Ecological Section of the Environmental Impact Study of an existing Cattle Fattening infrastructure.

	Production	Poland.
2016	Land Management	Strategic Ecological Assessment of Vale da Telha's Detail Plan. Portugal.
2016	Nature Conservation	Bird Census and Vulnerability Assessment Study of the Disturbance of the International Douro Natural Park - Life Rupis Project. Portugal.
2016	Wind Energy	Iberian Wolf Monitoring of Montalegre's Wind Farm (operation phase, year 1), Portugal. Portugal.
2016	Wind Energy	Vegetation Recovery Status Checking of Lousã 2's Wind Farm Platforms. Portugal.
2016	Wind Energy	Bird and Bat Monitoring of Vila Lobos' Wind Farm (construction and operation phase). Portugal.
2016	Hydric Energy	Identification of floristic species with conservation interests of Foz Tua's powerlines (pre-construction phase). Portugal.
2016	Wind Energy	Bird and Bat Monitoring at Serra da Candeeiros' Wind Farm and its expansion area (operation phase). Portugal.
2016	Agriculture	Bat Monitoring at Caliços-Machados' Hydraulic circuit of Alqueva's Irrigation System (EFMA). Portugal.
2016	Tourism	Ecological Section of the Environmental Impact Study of Guia's Inn. Portugal.
2016	Hydric Energy	Zebra mussel monitoring at Alqueva's Irrigation System (EFMA) dams (2016/2017). Portugal.
2016	Wind Energy	Success Evaluation of the Implementation of the Management Plan for temporary lagoons at Lagoa Funda Wind Farm. Portugal.
2016	Hydric Energy	Monitoring of the phish populations and the emptying of the Dam of Hortas-Lever. Portugal.
2016	Nature Conservation	Ecological characterization of Jamor's River. Portugal.
2016	Urban	Ecological Section of the Environmental Impact Study of an Continuous Heatlh Care Unit Project in Pedreiras, Porto de Mós city, Portugal. Portugal.
2016	Roads	Monitoring of the ecological systems of Baixo Alentejo's Highway (contruction pahse). Portugal.
2016	Wind Energy	Environmental Report of the Arrimal Wind Farm - legal framework for the Portuguese Environmental Authorithy (APA - Portuguese Environment Agency) . Portugal.
2016	Wind Energy	Verification of the Recovery of Intervened Areas in Vila Lobos' Wind Farm. Portugal.
2016	Maritime	Ecological Impact Assessment of the Dune Cord's Reinforcement Environmental Compliance Report of Armona and Tavira's Islands - Fuseta-Mar Beach and west of Tavira Island. Portugal.
2016	Maritime	Monitoring of the Ecological and Evolutionary Components of the Estuarine bottoms for the Sediment Transposition Project of Mira's river mouth for dune Reinforcement purposes. Portugal.
2016	Wind Energy	Flora Monitoring at the expansion area of Candeeiros' Wind Farm (operation phase). Portugal.
2016	Maritime	Ecological technical note on Cavacos and Barril beaches. Portugal.
2016	Wind Energy	Design of the mortality monitoring plan of Malhadas' Wind Farm (year 0 update). Portugal.
2016	Wind Energy	Avifauna Specialist Pre-feasibility analysis and Risk Assessment of the proposed Inkamcwa Wind Energy Facility, Eastern Cape, South Africa. South Africa.
2016	Solar Energy	Fauna Specialist Impact Assessment: Cape Leopard for the proposed Bonnievale Solar Energy Facility, Western Cape, South Africa. South Africa.
2016	Solar Energy	Peer-revision of the Environmental Impact Assessment (Avifauna specialist impact assessment draft report) of the proposed Bonnievale Solar Energy Facility, Western Cape, South Africa. South Africa.
2016	Wind Energy	Environmental Impact Assessment (Avifauna specialist impact assessment) of the proposed Sommerset East Wind Energy Facility, Eastern Cape, South Africa. South Africa.
2016	Wind Energy	Avifauna community pre-construction phase monitoring program of the proposed Haga Haga Wind Energy Facility, Eastern Cape Province, South Africa. South Africa.
2016	Wind Energy	Avifauna Pre-feasibility analysis and Risk Assessment of the proposed Stutterhein Wind Energy Facility, Eastern Cape, South Africa. South Africa.
2016	Wind Energy	za43 - Spitskop East WEF
2016	Wind Energy	Bats and Avifauna Pre-feasibility analysis and Risk Assessment of the proposed Suurvlakte Wind Energy Facility, Western Cape, South Africa. South Africa.
2016	Wind Energy	Environmental Impact Assessment (Bat specialist impact assessment) of the proposed De Boom Wind Energy Facility, Western Cape, South Africa.. South Africa.
2016	Wind Energy	Bird and Bat Pre-Construction Monitoring and Impact Assessment for the proposed Hartbeest WEF - Update on previous monitoring protocols. South Africa.
2016	Wind Energy	Fauna Specialist Ground-Truthing of the Copperton Wind Energy Facility, Northern Cape, South Africa. South Africa.
2015	Mining	Monitoring of periphytic algae associated to Environmental Management Plan (PGA) of Moatize Industrial Complex and its Expansion. Mozambique.
2015	Land Management	Biological Section of Odeceixe-Vilamoura's Coastline Programme. Portugal.
2015	Wind Energy	Monitoring and Implementation of the minimization strategies on flora and at Serra da Freita I and II Farm Wind. Portugal.
2015	Wind Energy	Bird Monitoring at Picos-Vale do Chão Wind Farm and power line (60kV) (construction and operation phase). Portugal.

2015	Wind Energy	Bird Monitoring at Douro Sul Wind Farm (Power Line 400kV, Moimenta and Sernancelhe sub-wind farms (construction and operation phase). Portugal.
2015	Maritime	Implementation of the Biological Communities Monitoring Plan of Formosa's Estuary Hydrodynamics Valorisation Plan. Portugal.
2015	Wind Energy	Bat Monitoring at Escoural's Wind Farm (Year 0). Portugal.
2015	Nature Conservation	Elaboration of the Biodiversity Study and Characterization of Xarraz's forest area under the Xarraz's Forest Park Design Project. Portugal.
2015	Education & Awareness	Scientific advisory to REN's project "Storks on the Web" (2009, 2010, 2011,2013, 2014 and 2015). Portugal.
2015	Hydric Energy	Fauna monitoring at Foz Tua Dam, Portugal (hydroelectric power station) - 2015 Summer and Spring Monitoring Program, Portugal. Portugal.
2015	Wind Energy	Flora Monitoring at Três Marcos' Wind Farm (pre-construction phase). Portugal.
2015	Wind Energy	Flora and bat roost monitoring at Escoural's Wind Farm (Year 0). Portugal.
2015	Electric Sector	Ecological Impact Assessment of Rio Maior - Carvoeira and Carregado - Rio Maior powerlines, 220/400 kV. Portugal.
2015	Wind Energy	Flora and vegetation monitoring at the Facho-Colmeia Wind Farm (operation phase). Portugal.
2015	Agriculture	Ecological clerk of works during the construction of Roxo-Sados' hydraulic circuit and irrigation block. Portugal.
2015	Electric Sector	Design of the Floristic Exotic Plan and Mapping Update of Vieira do Minho- Pedralva 2 powerline, Portugal. Portugal.
2015	Maritime	Ecological Impact Assessment of the Expansion of Peniche's Shipyards. Portugal.
2015	Agriculture	Bird monitoring along Alvito-Pisão water chanel inserted in the Alqueva Irrigation System (EFMA). Portugal.
2015	Wind Energy	Bat Monitoring at Lagoa D. João e Feirão Wind Farm. Portugal.
2015	Roads	Biological Section of the Road Project "EN 233 - Guarda (IP2/A23 km 1+635) and Sabugal (ER324 km 25+010) – Beneficiação", Portugal. Portugal.
2015	Roads	Ecological Section of the Environmental Impact Studies for the road change (12 km) of Minho Center. Portugal.
2015	Maritime	Barrinha de Esmoriz's Rehabilitation and Enhancement Intervention Monitoring Programme (Pre-Construction Phase). Portugal.
2015	Maritime	Seahorses' Translocation Plan concerning Ria Formosa's dredging project at intervention area number 2 (Faro / Olhão). Portugal.
2015	Hydric Energy	Implementation of compensatory measure at Foz Tua's Dam - Predation Risk Reduction on pyrenean desman. Portugal.
2015	Electric sector	Ecological Section of the Environmental Impact Study for Estremoz-Divor's Powerline. Portugal.
2015	Oil & Gas	Ecological Section of the Environmental Impact Assesment of Celorico-Vale de Frades gas pipeline. Portugal.
2015	Maritime	Water quality moitoring in the area of intervention of the Ria Formosa's Hydrodynamics Valorisation Plan - Tavira and Armona sections. Portugal.
2015	Roads	Ecological Section of the Road Project "EN362 - Beneficiação km 22+344" Santarém county boundary with Porto de Mós and km 51 + 713 junction with EN3 near Santarém. Portugal.
2015	Electric sector	Ecological Section of the Environmental Impact Study of underground Powerlines at Custóias-Vermoim 3, Custóias-Prelada 2 e Prelada-Vermoim 3, 220 kV. Portugal.
2015	Maritime	Monitoring of Terrestrial Biological Communities at the Intervention area of the Redevelopment Project of barrier islands and islets - Renaturalisation and of Ria Formosa's Hydrodynamics Valorisation Plan. Portugal.
2015	Other	Ecological Section of the Environmental Impact Study of the new tissue paper Industrial Unit to be built at Vila Velha de Rodão. Portugal.
2015	Hydric Energy	Ecological Section of the Environmental Impact Study Addendum of Calheta's Dam (pipe amendments), Portugal. Portugal.
2015	Wind Energy	Bird, Bat, Flora and Vegetation Monitoring at the expansion area of Lousã II Wind Farm (construction phase). Portugal.
2015	Maritime	Water quality monitoring regarding the interventions made under Ria Formosa's Hydrodynamics Valorisation Plan and Risk mitigation at Barrier islands and islets - Faro-Olhão section. Portugal.
2015	Land Management	Ecological Section of the Strategic Environmental Assessment of eight Hydrographic Management Plans. Portugal.
2015	Roads	Update of the biotopes and habitats on Minho's North roadways. Portugal.
2015	Wind Energy	Flora Monitoring at the expansion area of Candeeiros Wind Farm (construction phase). Portugal.
2015	Wind Energy	Bird Monitoring at Três Marcos' Wind farm (construction and operation phase). Portugal.
2015	Wind Energy	Ecological Impact Assessment of Mirandela Wind Farm. Portugal.
2015	Hydric Energy	Design of the Ecological Monitoring Plan of Mondego's river Dam. Portugal.
2015	Roads	

		Water quality monitoring during the construction phases of the Baixo Alentejo Highway. Portugal.
2015	Hydric Energy	Environmental Impact Assesment of the River Fauna of Foz Tua's Dam Mobility Plan. Portugal.
2015	Wind Energy	Bird community pre-construction monitoring program of the proposed Witsand Wind Energy Facility, Western Cape Province, South Africa. South Africa.
2015	Wind Energy	Bird community pre-construction phase monitoring program of the proposed Noblesfontein 2 Wind Energy Facility, Western Cape Province, South Africa. South Africa.
2015	Wind Energy	Bat community operation phase monitoring program of the ESKOM Sere Wind Energy Facility, Western Cape Province, South Africa (Year 1, 2 and 3). South Africa.
2015	Wind Energy	Environmental Impact Assessment (Fauna specialist impact assessment) of the proposed Spitskop West Wind Energy Facility, Eastern Cape, South Africa . South Africa.
2015	Wind Energy	Environmental Impact Assessment (Bat specialist impact assessment) of the proposed Kudusberg Wind Energy Facility, Northern Cape, South Africa. South Africa.
2015	Solar Energy	Environmental Impact Assessment (Avifauna specialist impact assessment) Heuningklip Solar Energy Facility, Western Cape, South Africa. South Africa.
2014	Electric Sector	Ecological section of the Environmental Compliance Report of the porwerlines between Carrapatelo, Fridão, Ribeira de Pena and Vila Pouca de Aguiar , 400kV, Portugal. Portugal.
2014	Electric Sector	Iberian Wolf Monitoring associated to the environmental clerk of works of Vieira do Minho´s 400 kV power line, Portugal. Portugal.
2014	Agriculture	Aquatic ecosystems’ monitoring at Ferradosa’s dam, Portugal (operation phase). Portugal.
2014	Nature Conservation	Scientific and technical advisory to the GAC Oeste Project (Portugal) - Berlengas Biophere Reserve: Plan for the evaluation of Biodiversity and Ecosystem Services. Portugal.
2014	Wind Energy	Bulb transplant in the new access to the turbine 28 at Serra de Candeeiros’ Wind Farm, Portugal (operation phase). Portugal.
2014	Offshore Energy	Environmental Characterization Study of the Portuguese Offshore Pilot Zone of ENONDAS, S.A., Portugal. Portugal.
2014	Hydric Energy	Fauna monitoring and specialist studies to be integrated in the Environmental Management of Girabolhos’ Hydroelectric Power Plant, Portugal (pre-construction phase). Portugal.
2014	Wind Energy	Bird and Bat monitoring at Vila Lobos' Wind Farm, Portugal (pre-construction phase). Portugal.
2014	Wind Energy	Assessment of the use of a Bonelli's eagle’s nest in the surroundings of Figueira Brava Wind Farm, Portugal. Portugal.
2014	Wind Energy	Bird, Bat and Flora Monitoring at the Portela do Pereiro’s Wind Farm, Portugal (operation phase). Portugal.
2014	Wind Energy	Bird, Bat and flora monitoring at Altos dos Forninhos’ Wind Farm (operation phase). Portugal.
2014	Wind Energy	Ecological Impact Assessment of the Três Marcos II's Wind Farm, Portugal. Portugal.
2014	Electric Sector	Characterization of the land use, flora and fauna for the amendment of the 400Kv power line interconnection between South Douro’s Wind Farm, Armamar substation and Moimenta’s Wind Farm Substation, Portugal. Portugal.
2014	Wind Energy	Amphibians, Reptiles and Terrestrial Mammals monitoring and Land clearing, soil and biomass management plan at Três Marcos' Wind Farm, Portugal. Portugal.
2014	Wind Energy	Bird, Bat, flora and vegetation monitoring at Vale da Estrela’s Wind Farm (construction and operation phase), Portugal. Portugal.
2014	Electric Sector	Flora Monitoring at Vieira do Minho's substation, Portugal. Portugal.
2014	Nature Conservation	Development of an Educational programme for three protected wildlife species. Portugal.
2014	Wind Energy	Technical report on mitigation techniques to reconcile a Finnish Wind Farm with Golden Eagle, Finland. .
2014	Wind Energy	Implementation of an invasive species Management Plan at Lousã II Wind Farm, Portugal. Portugal.
2014	Nature Conservation	Monitoring of the Arzila's Marsh natural values, Vouga River , Tejo Estuary and Corno do Bico (2014-2015), Portugal. Portugal.
2014	Mining	Bat ecological assessment for the Former Mining Area of Santo António de Penedono Rehabilitation Project, Portugal. Portugal.
2014	Electric Sector	Ecological Impact Assesment and bird monitoring of Iberdrola's powerlines (construction phase), Portugal. Portugal.
2014	Hydric Energy	Implementation of the minimization strategies on the fish populations associated to the emptying the water masses of Foz Tua's Dam (Construction Phase), Portugal. Portugal.
2014	Hydric Energy	Ecological Section of the Environmental Compliance Report of the connection of Foz Tua Dam, 400 kV, to the National Network for Energy Transportation, Portugal. Portugal.
2014	Wind Energy	Bird Monitoring at Escoural's Wind Farm (Year 0). Portugal.
2014	Wind Energy	Bat monitoring at Alvaiázere Wind Farm (5th year monitoring - operation phase). Portugal.
2014	Wind Energy	Bird and Bat Post-construction Monitoring at Noblesfontein Wind Energy Facility (Northern Cape). South Africa.
2013	Wind Energy	Ecological clerk of works and flora monitoring at Prados Wind Farm, Portugal (construction phase). Portugal.
2013	Wind Energy	Design and Implementation of the Montagu’s Harrier (Circus pygargus) Offset Programme at Prados Wind

		Farm. Portugal.
2013	Wind Energy	Design and implementation of the Common Kestrel (Falco tinnunculus) Mitigation and Offset Programme at Candeeiros Wind Farm. Portugal.
2013	Wind Energy	Bird including red-billed cough, and flora monitoring at Candeeiros Wind Farm, Portugal (operation phase 2005-2015). Portugal.
2013	Wind Energy	Bird monitoring, including red-billed cough, and flora monitoring at Candeeiros Wind Farm, Portugal (operation phase 2005-2015). Portugal.
2013	Wind Energy	Flora and vegetation monitoring at the Serra da Freita Wind Farm, Portugal (operation phase). Portugal.
2013	Wind Energy	Montagu's Harrier (Circus pygargus) monitoring at Chiqueiro Wind Farm, Portugal (operation phase). Portugal.
2013	Wind Energy	Flora and vegetation monitoring at the expansion area of Serra da Freita I Wind Farm (pre-construction and construction phases). Portugal.
2013	Wind Energy	Flora monitoring at the expansion area of Bornes Wind Farm, Portugal (pre-construction phase). Portugal.
2013	Education & Awareness	Scientific advisory to REN's project "Storks on the Web" (2009, 2010, 2011, 2013, 2014 and 2015). Portugal.
2013	Wind Energy	Endangered flora species (Veronica micrantha) monitoring at Bornes Wind Farm, Portugal (extension of the monitoring period in the operation phase). Portugal.
2013	Wind Energy	Design and implementation of the Bird Offset Programme at Mértola Wind Farm, Portugal. Portugal.
2013	Wind Energy	Bird monitoring at Mértola's Wind Farm (pre-construction, construction and operation phases). Portugal.
2013	Wind Energy	Bird monitoring at Mértola's Wind Farm, Portugal (pre-construction, construction and operation phases). Portugal.
2013	Water Treatment	Ecological risk analysis associated with the activities of "Águas de Santo André, SA" (ADSA) in the management, operation and maintenance of the facilities and equipment of Santo André's wastewater subsystem, Portugal. Portugal.
2013	Wind Energy	Bat and flora monitoring at the expansion area of Candeeiros Wind Farm, Portugal (pre-construction phase). Portugal.
2013	Maritime/ Ports	Bird, flora and benthic macroinvertebrates monitoring at the Termitrena terminal in Setúbal (operation phase, year 1 and 2). Portugal.
2013	Tourism	Fauna specialist studies associated to the Environmental Impact Assessment of Vale do Freixo Touristic Development, Portugal. Portugal.
2013	Water Treatment	Water quality control at the waste water system of Águas de Santo André, Portugal. Portugal.
2013	Electric Sector	Ecological Impact Assessment of the Vieira do Minho – Pedralva 1 high tension power line (400kV) and the shift to Vieira do Minho station (400 kV), Portugal. Portugal.
2013	Animal Production	Environmental Impact Assessment and Environmental Compliance Report of the expansion of a sole fishfarm in Torreira, Aveiro. Portugal.
2013	Tourism	Design of the fauna monitoring and management plans for a touristic development project at Herdade do Pontal in Ria Formosa's Natural Park, Portugal. Portugal.
2013	Electric Sector	Design of the Action Plan and the Monitoring Programme for a Bonelli eagle's couple occurring in the area of the Armamar-Recarei high tension power line (400kV), Portugal. Portugal.
2013	Electric Sector	Raptor nest searching in the Valpaços - Vila Pouca de Aguiar high tension power line, Portugal (pre-construction phase). Portugal.
2013	Tourism	Ecological section of the environmental compliance report of the Herdade do Mercador touristic development (Mourão, Portugal). Portugal.
2013	Water Treatment	Sampling, physical-chemical analysis and water quality monitoring at Morgavel water treatment plant, Portugal. Portugal.
2013	Electric Sector	Wolf monitoring at the Valpaços-Vila Pouca high tension power line area, Portugal (pre-construction phase). Portugal.
2013	Wind Energy	Bat activity assessment at blade height and ground level at the Escoural Wind Farm (pre-construction phase). Portugal.
2013	Nature Conservation	Ichthyofauna, diatoms and macroinvertebrates monitoring at the Project "River regularization of Rio Grande da Pipa" in Carregado, Portugal. Portugal.
2013	Wind Energy	Peer-review of the ecology section of the Picos - Vale do Chão Wind Farm, Portugal. Portugal.
2013	Electric Sector	Flora and habitat monitoring at Vieira do Minho 400kV power lines (pre-construction phase), Portugal. Portugal.
2013	Tourism	Scientific advisory for the valuation of the bird resources at the Herdade do Mercador touristic development, Mourão, Portugal. Portugal.
2013	Nature Conservation	Biodiversity assessment at the Coina's River Marshland Local Nature Reserve and Machada National Forest, Portugal. Portugal.
2013	Wind Energy	Bird, bat, flora and vegetation monitoring at Mosqueiros II Wind Farm and its expansion area (pre-construction, construction and operation phase). Portugal.
2013	Wind Energy	Bird, bat, flora and vegetation monitoring at Mosqueiros II Wind Farm, Portugal, and its expansion area

		(pre-construction, construction and operation phase). Portugal.
2013	Water Treatment	Advisory to the Ecological Impact Assessment of water distributions systems in the cities of Saurimo and Ndalatando, Angola. .
2013	Electric Sector	Ecological Impact Assessment of the high tension power lines in the area of the Alto Tâmega Hydroelectric Power Plants, Portugal. Portugal.
2013	Mining	Ecology section for the environmental impact assessment of the extension of quarry nr. 4735 in Laboeira, Portugal. Portugal.
2013	Industry	Ecological Impact Assessment of a paper industry in Vila Velha de Rodão and Strategic Ecological Assessment for the expansion of the municipality’s industrial area, Portugal. Portugal.
2013	Wind Energy	Flora and vegetation (pre-construction) and bird (pre-construction and construction phases) monitoring at Alto dos Forninhos Wind Farm, Portugal. Portugal.
2013	Urban	Ecological Impact Assessment of IKEA's commercial complex in Algarve, Portugal. Portugal.
2013	Wind Energy	Development of the "Guidance on avian post construction monitoring techniques for wind and solar energy facilities with specific reference to Migrating Soaring Birds (MSB) in the Rift Valley/Red Sea Flyway" for BirdLife International. .
2013	Wind Energy	Bird and bat pre-construction monitoring at Moorreesburg Wind Energy Facility (Western Cape, South Africa). South Africa.
2013	Wind Energy	Bird and bat pre-construction monitoring at Gouda II Wind Energy Facility (Western Cape, South Africa). South Africa.
2013	Wind Energy	Bird and bat pre-construction monitoring at Vredendal Wind Energy Facility (Western Cape, South Africa). South Africa.
2013	Wind Energy	Bird and bat pre-construction monitoring at Blue Wind Energy Facility (Northern Cape, South Africa). South Africa.
2013	Wind Energy	Bird and Bat Pre-construction Monitoring at Moorreesburg Wind Energy Facility (Western Cape). South Africa.
2013	Wind Energy	Bird and Bat Pre-construction Monitoring at IE Gouda Wind Energy Facility (Western Cape). South Africa.
2013	Wind Energy	Bird and Bat Pre-construction Monitoring at Vredendal Wind Energy Facility (Western Cape). South Africa.
2013	Wind Energy	Bird and Bat Pre-construction Monitoring at Stormberg Wind Energy Facility (Eastern Cape). South Africa.
2013	Wind Energy	Bird and Bat Pre-construction Monitoring at Gunstfontein Wind Energy Facility (Northern Cape). South Africa.
2013	Wind Energy	Bird and Bat Pre-construction Monitoring at Project Blue Wind Energy Facility (Northern Cape). South Africa.
2013	Wind Energy	Bird and Bat Pre-construction Monitoring at Moorreesburg Extension Wind Energy Facility (Western Cape). South Africa.
2013	Wind Energy	Bird and Bat Pre-construction Monitoring at Sere Wind Energy Facility (Western Cape). South Africa.
2013	Wind Energy	Bird and bat pre-construction monitoring at Vredendal Wind Energy Facility (Western Cape, South Africa). South Africa.
2012	Electric Sector	Ecological Impact Assessment of the Baixo Sabor-Pocinho power line, Portugal. Portugal.
2012	Wind Energy	Wolf, bats and birds monitoring at Mirandela wind farm, Portugal (pre-construction phase). Portugal.
2012	Wind Energy	Ecological Impact Assessment of Mirandela Wind Farm, Portugal. Portugal.
2012	Wind Energy	Bird, bat and flora monitoring at Tocha’s Wind Farm, Portugal (pre-construction and construction phase). Portugal.
2012	Wind Energy	Bird monitoring at Lagoa Funda Wind Farm, Portugal (operation phase). Portugal.
2012	Wind Energy	Implementation of an invasive flora species (Acacia sp.) Management Plan at Lousã I Wind Farm (operation phase). Portugal.
2012	Wind Energy	Bird and flora monitoring at Chão Falcão I Wind Farm, Portugal (operation phase). Portugal.
2012	Wind Energy	Bird and bat monitoring at Figueira Brava wind farm, Portugal (pre-construction phase). Portugal.
2012	Wind Energy	Ecological section of the environmental impact assessment at Figueira Brava wind farm, Portugal. Portugal.
2012	Wind Energy	Bird and flora monitoring (pre-construction, construction and operation phases) and bat monitoring (operation phase) at Lousã II Wind Farm, Portugal, including its expansion area. Portugal.
2012	Electric Sector	Implementation of the Offset and Monitoring Programme focused on black stork at the Macedo de Cavaleiros-Valpaços power line 220 kV (400 kV). Portugal.
2012	Wind Energy	Ecological Impact Assessment of Maunça’s Wind Farm, Portugal. Portugal.
2012	Water Treatment	Preliminary assessment of the ecological status of the water at the exit of the wastewater system of the Aljustrel Mining Park, Portugal. Portugal.
2012	Urban	Environmental Impact Assessment of Valley Park’s Project - Cartaxo's Business Park, Portugal. Portugal.
2012	Wind Energy	Bird, including red-billed chough (pre-construction, construction and operation phases), flora and vegetation (construction and operation phase) monitoring at Meroicinha II Wind Farm. Portugal.
2012	Wind Energy	Bird, including red-billed chough (pre-construction, construction and operation phases), flora and vegetation (construction and operation phase) monitoring at Meroicinha II Wind Farm, Portugal. Portugal.

2012	Agriculture	Zooplankton sampling and assessment in surface freshwater of the Alqueva Irrigation System (EFMA, Portugal): Alfundão, Serpa and Brinches-Enxoé irrigation systems. Portugal.
2012	Mining	Ecological section of the additional information to be included in the Environmental Impact Assessment of the quarry Cimo das Lameiras do Rio, Portugal. Portugal.
2012	Roads	Assessment of the biological status of water under the Water Framework Directive at A43 / IC29 Douro Litoral Highway: Gondomar / Aguiar de Sousa (IC24), Portugal. Portugal.
2012	Electric sector	Ecological Impact Assessment of the power intensification at Salamonde II, Venda Nova III and Frades B substation, Portugal. Portugal.
2012	Wind Energy	Flora, vegetation and bird monitoring at Maunça Wind Farm, Portugal (pre-construction phase). Portugal.
2012	Wind Energy	Bird and bat monitoring at 3 Marcos Wind Farm, Portugal (pre-construction phase). Portugal.
2012	Wind Energy	Ecological constraints analysis and Ecological Impact Assessment at 3 Marcos Wind Farm, Portugal (pre-construction phase). Portugal.
2012	Mining	Ecological section of a scoping proposal for a mining project in the river Douro area, Tabuaço, Portugal. Portugal.
2012	Nature Conservation	Determination of the hydromorphological quality of three streams located in Canedo / Santa Maria da Feira, Portugal. Portugal.
2012	Wind Energy	Implementation of an invasive flora species (Acacia sp.) management plan at Pampilhosa da Serra Wind Farm (operation phase). Portugal.
2012	Wind Energy	Monitoring of a vertical bat roost at Malhanito Wind Farm, Portugal (pre-construction, construction and operation phases). Portugal.
2012	Mining	Design of conservation measures for Unio crassus' emergency and population maintenance plan at the river Sado Basin associated to a mining infrastructure, Portugal. Portugal.
2012	Agriculture	Steppe bird monitoring at Alfundão and Ferreira Valbom irrigation areas inserted in the Alqueva Irrigation System (EFMA, Portugal). Portugal.
2012	Wind Energy	Bird and flora monitoring at Meadas wind farm, Portugal (operation phase). Portugal.
2012	Electric sector	Design of the Offset Programme focused on a Bonelli’s eagle pair and assessment of its effectiveness at Portimão-Tunes North / Portimão-Tunes 3 power line (400/150kV) – alternative layout at the crossing of Funcho and Arade Dams, Portugal. Portugal.
2012	Wind Energy	Implementation of the Management Plan for the temporary lagoons at Lagoa Funda Wind Farm (operation phase - 2012 and 2013). Portugal.
2012	Hydric Energy	Baseline assessment of the current ecological status of the river mussel (Margaritifera margaritifera) population in River Tuela associated to Trutas Dam (Small Hydro), Portugal. Portugal.
2012	Electric Sector	Bird monitoring at the 150 kV power line connecting the Fernão Ferro substation to the 400 kV power line of Palmela - Ribatejo, Portugal. Portugal.
2012	Electric sector	Flora and habitat monitoring at the 400 kV power line of Palmela-Ribatejo in the Fernão Ferro substation, Portugal. Portugal.
2012	Tourism	Ecological Impact Assessment for the Ota’s Driving School & Technology Centre, Portugal. Portugal.
2012	Electric sector	Ecological Impact Assessment of the high tension power line and its substations between Alfena – Vila do Conde – Vila Fria (Portugal) and Spain (400 kV). Portugal.
2012	Roads	Ecological section of the Environmental Compliance Report and design of the Mitigation measures for the construction of the main road IC35 - Guilhufe (A4/IP4) / Rans junctions, Portugal. Portugal.
2012	Industry	Ecological Impact Assessment of a waste incineration unit in the municipality of Chamusca at the Relvão’s Eco Park, Portugal. Portugal.
2012	Wind Energy	Transplantation of the endangered flora species Scilla ramburei subsp. beirana prior to the construction of Prados Wind Farm, Portugal. Portugal.
2012	Water Treatment	Water quality monitoring at Santo André beach and Moinhos stream, Portugal. Portugal.
2012	Hydric Energy	Ecological Impact Assessment of the Calheta and Pico da Urze’s Dam, Portugal (hydroelectric power station). Portugal.
2012	Wind Energy	Bat pre-construction monitoring at Hopefield Wind Energy Facility (Western Cape, South Africa). South Africa.
2012	Wind Energy	Bird and bat pre-construction monitoring at Noblesfontein Wind Energy Facility (Northern Cape, South Africa). South Africa.
2012	Wind Energy	Bat pre-construction monitoring at West Coast I Wind Energy Facility (Western Cape, South Africa). South Africa.
2012	Wind Energy	Bat pre-construction monitoring at Rheboksfontein Wind Energy Facility (Western Cape, South Africa). South Africa.
2012	Wind Energy	Bird and bat pre-construction monitoring at Tsitsikamma Wind Energy Facility (Eastern Cape, South Africa). South Africa.
2012	Wind Energy	Bird and bat pre-construction monitoring at Tiqua Wind Energy Facility (Western Cape, South Africa). South Africa.
2012	Wind Energy	Bat pre-construction monitoring at Dorper Wind Energy Facility (Eastern Cape, South Africa). South Africa.

2012	Wind Energy	Scoping and bat ecological assessment for the Zen Wind Energy Facility project (Western Cape, South Africa). South Africa.
2012	Wind Energy	Bird and bat pre-construction Monitoring at Kangnas Wind Energy Facility (Northern Cape, South Africa). South Africa.
2012	Wind Energy	Bird and bat pre-construction monitoring at Gouda Wind Energy Facility (Western Cape, South Africa). South Africa.
2012	Wind Energy	Bird and bat pre-construction monitoring at Springfontein Wind Energy Facility (Free State, South Africa). South Africa.
2012	Wind Energy	Peer-review of the bird pre-contruction monitoring reports for the Hluhluwe Wind Energy Facility project (KwaZulu Natal, South Africa). South Africa.
2012	Wind Energy	Bird and bat pre-construction monitoring at Swellendam Wind Energy Facility (Western Cape, South Africa). South Africa.
2012	Wind Energy	Peer-review of the bird pre-contruction monitoring reports for the Richards Bay Wind Energy Facility project (KwaZulu Natal, South Africa). South Africa.
2012	Wind Energy	Bat pre-construction monitoring program at Hopefield Wind Energy Facility (Western Cape, South Africa). South Africa.
2012	Wind Energy	Environmental Impact Assessment (Avifauna specialist environmental assessment) of the proposed Hopefield Wind Energy Facility, Western Cape, South Africa. South Africa.
2012	Wind Energy	Bird and bat pre-construction monitoring at Noblesfontein Wind Energy Facility (Northern Cape, South Africa). South Africa.
2012	Wind Energy	Bat pre-construction monitoring program at West Coast I Wind Energy Facility (Western Cape, South Africa). South Africa.
2012	Wind Energy	Bat pre-construction monitoring program at Rheboksfontein Wind Energy Facility (Western Cape, South Africa). South Africa.
2012	Wind Energy	Bird and bat pre-construction monitoring program at Tsitsikamma Wind Energy Facility (Eastern Cape, South Africa). South Africa.
2012	Wind Energy	Bird and bat pre-construction monitoring program of the proposed Tiqua/EXXARO Wind Energy Facility (Western Cape, South Africa). South Africa.
2012	Wind Energy	Bat pre-construction monitoring program at Dorper Wind Energy Facility (Eastern Cape, South Africa). South Africa.
2012	Wind Energy	Scoping and bat ecological assessment for the Zen Wind Energy Facility project (Western Cape, South Africa). South Africa.
2012	Wind Energy	Bird and bat pre-construction monitoring program of the proposed Zen Wind Energy Facility, Western Cape Province, South Africa. South Africa.
2012	Wind Energy	Bird and bat pre-construction Monitoring program at Kangnas Wind Energy Facility (Northern Cape, South Africa). South Africa.
2012	Wind Energy	Bird and bat pre-construction monitoring at Gouda Wind Energy Facility (Western Cape, South Africa). South Africa.
2012	Wind Energy	Bird and bat pre-construction monitoring at Springfontein Wind Energy Facility (Free State, South Africa). South Africa.
2012	Wind Energy	Peer-review of the bird pre-contruction monitoring reports for the Hluhluwe Wind Energy Facility project (KwaZulu Natal, South Africa). South Africa.
2012	Wind Energy	Bat Specialist Environmental Impact Assessment of the proposed Richards bay Wind Energy Facility, Kuazulu Natal, South Africa. South Africa.
2012	Wind Energy	Environmental Impact Assessment (Avifauna specialist environmental assessment) of the Goereesoe (Swellandam) Wind Energy Facility, Western Cape, South Africa. South Africa.
2012	Wind Energy	Bird and bat pre-construction monitoring at Swellendam Wind Energy Facility (Western Cape, South Africa). South Africa.
2012	Wind Energy	Bird monitoring program of the proposed Goereesoe (Swellandam) Wind Energy Facility, Western Cape Province, South Africa. South Africa.
2012	Wind Energy	Bat monitoring program of the proposed Goereesoe (Swellandam) Wind Energy Facility, Western Cape Province, South Africa. South Africa.
2012	Wind Energy	Bat monitoring program of the proposed Richards Bay Wind Energy Facility, KwaZulu-Natal Province, South Africa. South Africa.
2012	Wind Energy	Peer-review of the bird pre-contruction monitoring reports for the Richards Bay Wind Energy Facility project (KwaZulu Natal, South Africa). South Africa.
2011	Training	Course on Environmental Assessment of Projects, Plans and Programmes under the Natura 2000 Network (18th November 2011, Lisbon, Portugal). Portugal.
2011	Agriculture	Terrestrial flying vertebrates carcass searches along the Alvito-Pisão water channel inserted in the Alqueva Irrigation System (EFMA, Portugal) using wildlife research dogs. Portugal.
2011	Wind Energy	Bonelli's eagle monitoring at Serra do Mú Wind Farm, Portugal (pre-construction, construction and operation phase). Portugal.

2011	Hydric Energy	Ecological Impact Assessment of Carvão-Ribeira's Dam, Portugal (hydroelectric power station). Portugal.
2011	Nature Conservation	Ecological section of the project design for the protection of cliffs and dune systems under the Polis Litoral Sudoeste Program, Portugal. Portugal.
2011	Wind Energy	Bird including red-billed cough, and flora monitoring at Candeeiros Wind Farm, Portugal (operation phase 2005-2015). Portugal.
2011	Nature Conservation	Biological analysis of sediments in Ria de Aveiro and Pateira de Fermentelos, Portugal. Portugal.
2011	Electric sector	Ecological Impact Assessment of the opening of the high tension power line Valdigem - Vermoim and its substations between Alfena – Vila do Conde – Vila Fria (Portugal) and Spain (400 kV). Portugal.
2011	Electric sector	Design and implementation of an Offset Programme focused on raptors, black stork and red-billed chough at the National Park of International Douro River and Távora's River valley, Portugal, for the Environmental Impact Assessment of the power line Lagoaça – Aldeadávila 1 (400kV), Pocinho – Aldeadávila 1/2 (220kV) and Armamar – Lagoaça (400kV). Portugal.
2011	Wind Energy	Design of an invasive flora species' Management Plan at Picos – Vale do Chão Wind Farm, Portugal. Portugal.
2011	Hydric Energy	Ecological section of the Environmental Compliance Report of the Girabolhos Dam, Portugal (hydroelectric power station). Portugal.
2011	Electric sector	Design and implementation of an Offset Programme focused on raptors, black stork and red-billed chough at the National Park of International Douro River and Távora's River valley, Portugal, for the Environmental Impact Assessment of the power line Lagoaça – Aldeadávila 1 (400kV), Pocinho – Aldeadávila 1/2 (220kV) and Armamar – Lagoaça (400kV). Portugal.
2011	Electric sector	Design and implementation of the bird monitoring plan at six 220 kV and 400 kV power lines at Lagoaça-Macedo de Cavaleiros crossing the International Douro Natural Park, Portugal. Portugal.
2011	Wind Energy	Bird, bat and flora monitoring at Chão Falcão II Wind Farm, Portugal (construction and operation phase). Portugal.
2011	Wind Energy	Bird, bat and flora monitoring at Chão Falcão II Wind Farm, Portugal (pre-construction, construction and operation phases). Portugal.
2011	Wind Energy	Bat monitoring at Serra de Bornes Wind Farm, Portugal (operation phase). Portugal.
2011	Wind Energy	Invasive species monitoring at Picos - Vale do Chão Wind Farm and its power line (60 kV) connecting to the Lousã II - Penela power line, Portugal. Portugal.
2011	Wind Energy	Bird and bat monitoring at Malhanito's Wind Farm (pre-construction, construction and operation phases). Portugal.
2011	Wind Energy	Bird and bat monitoring at Malhanito's Wind Farm, Portugal (pre-construction, construction and operation phases). Portugal.
2011	Wind Energy	Design and implementation of the mitigation measures program directed at the Bonelli eagle at the Malhanito wind farm, Portugal. Portugal.
2011	Mining	Environmental Impact Assessment of a quarry located between Pé da Pedreira and Vale da Trave (Alcanede, Santarém, Portugal). Portugal.
2011	Electric sector	Bird monitoring at the Estremoz-Alandroal power line (400 kV) – complementary monitoring of steppe birds (pre-construction phase), Portugal. Portugal.
2011	Roads	Ecological Impact Assessment for the widening project (dual two-lanes to dual three-lanes) and resurfacing of the A3 Highway between Santo Tirso and Famalicão, Portugal. Portugal.
2011	Electric sector	Ecological Impact Assessment of the replacement project of the power line's section 3 at Armamar – Recarei (400 kV), Portugal. Portugal.
2011	Land Management	Strategic Ecological Assessment of the Management Plans for the hydrographical bays integrated in the hydrographical regions 6 (Sado/Mira), 7 (Guadiana) and 8 (Ribeiras do Algarve), Portugal. Portugal.
2011	Wind Energy	Ecological technical note on the over-equipment at Freita I Wind Farm, Portugal. Portugal.
2011	Hydric Energy	Fauna monitoring at Foz Tua Dam (hydroelectric power station) - pre-construction and construction phase. Portugal.
2011	Hydric Energy	Fauna monitoring at Foz Tua Dam (hydroelectric power station) - pre-construction and construction phase. Portugal.
2011	Agriculture	Survey of the endangered flora species Linaria ricardoi during the construction of the water channel Pisão-Beja and Pisão-Roxo associated to the Alqueva Irrigation System (EFMA, Portugal). Portugal.
2011	Hydric Energy	Bat and vegetation monitoring at the power reinforcement of Salamonde II Dam (hydroelectric power station - pre-construction phase). Portugal.
2011	Offshore Energy	Marine birds and mammals monitoring in the Portuguese pilot zone for testing offshore renewable energies. Portugal.
2011	Roads	Amphibian monitoring associated to the construction of a roundabout in the municipality of Olhão, Portugal. Portugal.
2011	Roads	Design of an ecological technical note to replace a viaduct for a new layout with a landfill, extending an existing hydraulic passage, in section 6 of the A4 Highway, Transmontana Sublease, Portugal. Portugal.
2011	Wind Energy	Wolf monitoring at Alto do Marco and Meroicinha II wind farms, Portugal (construction and operation phase). Portugal.

2011	Hydric Energy	Determination of the preference and aptitude curves for the fish species captured in the surveys for the Alvito's Dam, Portugal (hydroelectric power station) Environmental Compliance Report. Portugal.
2011	Land Management	Ecological section of the intervention projects for the recovery and protection of degraded dune systems, and renaturalisation of degraded natural areas – Polis Litoral Norte Program, Portugal. Portugal.
2011	Electric sector	Ecological Impact Assessment of the three projects of Recarei – Vermoim III's power line, Portugal (change of tension from 220kV to 400kV). Portugal.
2011	Wind Energy	Monitoring of the dune system's dynamics at Tocha's Wind Farm, Portugal (pre-construction, construction and operation phases). Portugal.
2011	Roads	Advisory on the technical decision about the Strategic Environmental Assessment of the National Road Network in Douro Sul, IC26 – Lamego/Trancoso (Portugal): the case for the Iberian wolf. Portugal.
2011	Roads	Ecological Impact Assessment of the construction project of the national road EN 109 between Espinho (km 18+400), the Municipality of Ovar (km 40+200) and EN 109 – alternative to Macedo, Portugal. Portugal.
2011	Electric sector	Ecological constraints analysis and Ecological Impact Assessment of the high tension power lines construction project between Frades B and Pedralva, Portugal. Portugal.
2011	Roads	Revaluation of the mitigation measures proposed for the widening of the A28 Highway between Freixieiro and Póvoa do Varzim, Portugal. Portugal.
2011	Urban	Ecological section of the Environmental Compliance Report of Suldouro's new landfill, Portugal. Portugal.
2011	Wind Energy	Ecological Impact Assessment of the 3rd alternative to Cercal Wind Farm's power line, Portugal. Portugal.
2011	Hydric Energy	Ecological Impact Assessment of the medium tension power lines in the area of the Alto Tâmega Dams, Portugal (hydroelectric power stations). Portugal.
2011	Nature Conservation	Advisory on the ecological section of Ria Formosa's Mobility Plan. Portugal.
2011	Industry	Ecological Impact Assessment of the Font Salem Factory expansion, Portugal. Portugal.
2011	Land management	Design of the Biodiversity Action Plan and design of an Integrated Linear System for the City Parks in the municipality of Almada, Portugal. Portugal.
2011	Wind Energy	Bird (pre-construction, construction and operation phases) and flora and vegetation (operation phase) monitoring at Gardunha Wind Farm, Portugal. Portugal.
2011	Agriculture	Steppe bird monitoring at the south and west sections of the Ardila irrigation subsystem inserted in the Alqueva Irrigation System (EFMA, Portugal). Portugal.
2011	Wind Energy	Ecological Impact Assessment of Santiago do Escoural Wind Farm, Portugal. Portugal.
2010	Roads	Ecological clerk of works during the construction of the A4 Highway, Transmontana Sublease, crossing the Natura 2000 Sites "Serra do Alvão" and "Samil", Portugal. Portugal.
2010	Wind Energy	Bird monitoring at Picos - Vale do Chão Wind Farm, Portugal (pre-construction phase). Portugal.
2010	Wind Energy	Bird, bat and flora monitoring at Prados Wind Farm (pre-construction, construction and operation phases). Portugal.
2010	Wind Energy	Bird monitoring (operation phase) and flora and vegetation (pre-construction and operation phase) monitoring at Pampilhosa da Serra Wind Farm, Portugal. Portugal.
2010	Wind Energy	Iberian wolf monitoring at Serra de Bornes Wind Farm, Portugal (operation phase). Portugal.
2010	Electric sector	Bird monitoring at Castelo Branco - Ferro ½ power line and shift to the Fatela sub-station (220 kV), Portugal. Portugal.
2010	Electric Sector	Bird monitoring at Valdigem - Vermoim 4/5 power line - between the Valdigem sub-station and pole n.158 of the LVGVm (220 kV), Portugal. Portugal.
2010	Nature Conservation	Steppe bird monitoring at the Integrated Territorial Intervention area of Castro Verde, Portugal. Portugal.
2010	Roads	Flora and vegetation monitoring in the Litoral Oeste Highway Sublease, from the EN242 alternative sector to Nazaré, Portugal. Portugal.
2010	Roads	Fauna monitoring at the main road IP2's, Sector 4, between Longrovia and Trancoso, Portugal (construction phase). Portugal.
2010	Roads	Ecological Impact Assessment of the connection between the main road IC21 at the Coina junction to Sesimbra, Portugal. Portugal.
2010	Roads	Ecological section of the Environmental Compliance Report of the national road N249-4 execution project between the A5's Highway junction and Abrunheira, Portugal. Portugal.
2010	Roads	Ecological Impact Assessment of the preliminary study for the main road IP4's connection between Vinhais and Bragança, Portugal. Portugal.
2010	Roads	Ecological Assessment of the bridges rehabilitation project in Oeste, Alentejo, Sorraia River and main road IC8's (km 85+130) hydraulic passage, Portugal. Portugal.
2010	Tourism	Ecological section for the Herdade dos Despovoados Land Management Plan, Portugal. Portugal.
2010	Roads	Ecological Impact Assessment of the main road IP2 between Junqueira and Pocinho, Portugal. Portugal.
2010	Tourism	Ecological Impact Assessment of the infrastructures associated to the Touristic Development of Herdade do Mercador, Alqueva, Portugal. Portugal.
2010	Wind Energy	Rare, endemic, localized and threatened flora species monitoring at Picos - Vale do Chão Wind Farm,

		Portugal, and design of a flora and vegetation monitoring programme to be included in the project's Environmental Compliance Report. Portugal.
2010	Hydric Energy	Assessment of the biological status of water under the Water Framework Directive at Alvito's Dam, Portugal (hydroelectric power station) - pre-construction phase. Portugal.
2010	Land Management	Ecological section of the revision of Loulé´s Land Management Plan, Portugal. Portugal.
2010	Land Management	Strategic Ecological Assessment of the Polis Sudoeste Programme, Portugal. Portugal.
2010	Land Management	Terrestrial ecological section of the Tagus Estuary Management Plan, Portugal. Portugal.
2010	Land Management	Strategic Ecological Assessment of Bacelo's urban detailed plan in Quinta do Anjo, Palmela, Portugal. Portugal.
2010	Wind Energy	Flora and vegetation monitoring at Serra de Bornes wind farm, Portugal (pre-construction and operation phase). Portugal.
2010	Animal Production	Ecological Impact Assessment of the aviaries in Vale Longo and Cabral, Portugal. Portugal.
2010	Wind Energy	Ecological Impact Assessment of Cercal's Wind Farm, Portugal. Portugal.
2010	Electric sector	Ecological Impact Assessment of the very high tension power line at Tâmega's cascade, Portugal. Portugal.
2010	Hydric Energy	Ecological Impact Assessment of Salamonde Dam's, Portugal (hydroelectric power station) complementary flood discharger. Portugal.
2010	Hydric Energy	Ecological Impact Assessment of Calheta's Dam, Portugal (hydroelectric power station), Portugal. Portugal.
2010	Hydric Energy	Ecological section of the Environmental Compliance Report of the Alvito's Dam, Portugal (hydroelectric power station). Portugal.
2010	Hydric Energy	Assessment of the ecological status of the water at Trutas' Dam, Portugal (small-hydro) under the Water Framework Directive (operation phase). Portugal.
2010	Hydric Energy	Ichthyofauna, pyrenean desman, aquatic macroinvertebrates, flora and vegetation monitoring at Trutas' Dam – Mini Hydro, Portugal (pre-construction and operation phases). Portugal.
2010	Land Management	Ecological section of the Polis Litoral Ria de Aveiro, Portugal, Programme: study on economical activities and its dynamics. Portugal.
2010	Wind Energy	Habitat, Narcissus asturiensis and Armeria humillis (protected flora species) mapping at Meroicinha II Wind Farm, Portugal. Portugal.
2010	Wind Energy	Bird, flora and vegetation monitoring at São Macário II Wind Farm, Portugal (construction phase). Portugal.
2010	Roads	Ecological Impact Assessment for the widening of the A28 Highway between Freixieiro and Póvoa do Varzim, Portugal. Portugal.
2010	Agriculture	Scientific advisory to the project "Exploration of agroforesty systems on the left bank of the Guadiana River (Portugal) – a strategy for the sustainability of rural areas". Portugal.
2010	Electric sector	Flora and vegetation monitoring at Palmela - Ribatejo power line (400kV), Portugal (pre-construction and construction phases). Portugal.
2010	Land management	Ecological section of the Land Planning Project for the hydrographical regions of Lagoas Branca, Negra, Funda, Comprida, Rasa, Lomba e Patos, in Flores island, Azores, Portugal. Portugal.
2010	Maritime	Benthic macroinvertebrates monitoring at the turning basin of Alcântara's container port terminal, Portugal. Portugal.
2010	Roads	Fauna and flora monitoring at the main road IC9 - Alburitel / Carregueiros junction / Tomar (IC3), Portugal (pre-construction phase). Portugal.
2010	Airports	Peer-review and advisory on the study of bird movements in the New Lisbon Airport construction area, Portugal. Portugal.
2010	Roads	Ecological Impact Assessment and Environmental Compliance report of the alternative road to Capelas on the island of St. Miguel, Azores, Portugal. Portugal.
2010	Nature Conservation	Macroinvertebrate surveying at Lagoa da Palmeira (Tagus Estuary, Portugal), to determine the ecological status of the area and design of its decontamination plan. Portugal.
2010	Tourism	Ecological Impact Assessment in marine environment for Albufeira's sea boulevard, Portugal. Portugal.
2010	Land Management	Advisory for the integration of Natura 2000 guidelines into the revision of the municipality of Setubal's Land Management Plan. Portugal.
2010	Roads	Flora and vegetation monitoring at the new bridge crossing river Lima's at Jolda's junction (construction phase), Portugal. Portugal.
2010	Roads	Water quality monitoring during the pre-construction and construction phases of the Baixo Alentejo Highway, Portugal. Portugal.
2010	Tourism	Scoping phase of the Ecological Impact Assessment of a touristic development centre to be built at Herdade do Pontal in Ria Formosa's Natural Park, Portugal. Portugal.
2010	Agriculture	Biological and hydromorphological sections of the assessment of the ecological status of the Alqueva

		Irrigation System primary network (EFMA, Portugal). Portugal.
2010	Tourism	Execution of the project for the conservation and valuing of cultural tourism for the Iberian Wolf in the municipality of Vila Pouca de Aguiar, Portugal. Portugal.
2010	Agriculture	Design of the biodiversity monitoring programmes to be included in the Environmental Impact Assessment of Salamonde's Dam, Portugal (hydroelectric power station). Portugal.
2009	Hydric Energy	Ecological Impact Assessment of the Alvito's Dam (hydroelectric power station) and the 400kV high power line between the Dam and the Falagueira substation, Portugal. Portugal.
2009	Electric sector	Ecological Impact Assessment of the Ermesinde's substation rehabilitation, Portugal. Portugal.
2009	Urban	Strategic Ecological Assessment of the Urban Development Plan of Carvalhal and Lagoas, Portugal. Portugal.
2009	Wind Energy	Bird and bat monitoring at Serra da Nave Wind Farm, Portugal (pre-construction and operation phases). Portugal.
2009	Tourism	Ecological Impact Assessment of the housing development at Areia Branca's beach, Portugal. Portugal.
2009	Roads	Ecological Impact Assessment and design of the Offsets Programme for the main road IP8 between Baleizão and Vila Verde de Ficalho, Portugal. Portugal.
2009	Agriculture	Ecological clerk of works during the construction of the drainage, irrigation and roadway infrastructures associated to the Brinche's Hydro agriculture Project, inserted in the Alqueva Irrigation System (EFMA, Portugal). Portugal.
2009	Wind Energy	Habitat 4020 monitoring at Serra do Alvão Wind Farm, Portugal (pre-construction phase). Portugal.
2009	Roads	Ecological section of the Environmental Compliance Report for the execution project of conception, construction and operation of the A4 Highway, Transmontana Sublease between Vila Real and Bragança, Portugal. Portugal.
2009	Oil & Gas	Flora and vegetation monitoring at the high-pressure gas pipeline between Carriço and Leirosa-Lares, Portugal (post-construction phase). Portugal.
2009	Wind Energy	Terrestrial mammal monitoring at Carreço-Outeiro II Wind Farm, Portugal (pre-construction phase). Portugal.
2009	Agriculture	Bird monitoring at Pisão Dam inserted in the Alqueva Irrigation System (EFMA, Portugal). Portugal.
2009	Land Management	Strategic Ecological Assessment of Comporta's Territorial Action Programme, Portugal. Portugal.
2009	Wind Energy	Detailed mapping for the Lomba do Vale wind farm, Portugal. Portugal.
2009	Industry	Ecological section of the technical and environmental viability assessment of a water channel associated to a steel mill in the Tagus Estuary. Portugal.
2009	Wind Energy	Bird monitoring at Lomba do Vale Wind Farm, Portugal (construction phase). Portugal.
2009	Wind Energy	Bird monitoring at Lomba do Vale Wind Farm, Portugal (pre-construction phase). Portugal.
2009	Roads	Peer-review of the ecological assessment and mitigation programme related to construction of the Douro Interior Highway, Portugal. Portugal.
2009	Wind Energy	Bird and bat monitoring at Contim Wind Farm, Portugal (pre-construction, construction and operation phases). Portugal.
2009	Roads	Ecological section for the IC9-EN1 Fátima/Ourém (Portugal) Environmental Compliance Report. Portugal.
2009	Tourism	Habitat and Cabrera's vole colony mapping at the Herdade dos Despovoados in Zambujeira-do-Mar, Portugal. Portugal.
2009	Industry	Ecological Impact Assessment of RESPOL's resin plant in Leiria, Portugal. Portugal.
2009	Wind Energy	Ecological Impact Assessment of Alto do Marco's Wind Farm, Portugal. Portugal.
2009	Wind Energy	Bird and bat monitoring at Alto do Marco wind farm, Portugal (pre-construction phase). Portugal.
2009	Roads	Ecological section of the Preliminary Environmental Compliance Report for the conception, construction and operation of the Pinhal Interior Highway Sublease, Portugal. Portugal.
2009	Hydric Energy	Technical advisory and terrestrial fauna section of the Environmental Impact Assessment of the Salamonde - Salamonde II Dam, Portugal (hydroelectric power station). Portugal.
2009	Airports	Ecological Impact Assessment of Lisbon's New Airport in Alcochete, Portugal. Portugal.
2009	Hydric Energy	Ecological Impact Assessment of Baixo Sabor Dam's (hydroelectric power station) Power Line (220kV) between the upstream step and Pocinho's substation, Portugal. Portugal.
2009	Roads	Ecological Impact Assessment of the preliminary study for the road alternative to the national road EN229 - Viseu (IP5/IP25) - Sátão, Portugal. Portugal.
2009	Roads	Strategic Ecological Assessment of the development of the National Road Network in coastal Alentejo and Algarve, Portugal. Portugal.
2009	Hydric Energy	Fauna and flora monitoring at Alvito's Dam (hydroelectric power station) (pre-construction phase). Portugal.
2009	Wind Energy	Wolf monitoring at Meroicinha II Wind Farm, Portugal, through photo trapping (pre-construction phase). Portugal.
2009	Roads	Peer-review of the ecological assessment and mitigation programme related to construction of the Baixo Alentejo Highway, Portugal. Portugal.
2009	Nature	Mapping of floristic species with conservation status at São Bento wind farm's construction area, Portugal.

	Conservation	Portugal.
2009	Electric sector	Ecological advisory to an occurrence with white storks at the Recarei - Lavos power line (400 kV), Portugal. Portugal.
2009	Wind Energy	Baseline Ecological Assessment and bird and flora and vegetation monitoring at Cercal's Wind Farm, Portugal (pre-construction phase). Portugal.
2009	Wind Energy	Design of the terms of reference for the ecological assessment related to the installation of two Wind Farms in Venezuela. .
2009	Transports	Ecological Impact Assessment of three railway crossings in Alcácer do Sal, Portugal. Portugal.
2009	Roads	Peer-review of the ecological assessment and mitigation programme related to construction of the Algarve Litoral Highway, Portugal. Portugal.
2009	Maritime/ Ports	Ecological Impact Assessment of the Alcântara's container port terminal, Portugal. Portugal.
2009	Wind Energy	Bird monitoring at Bornes Wind Farm, Portugal (operation phase). Portugal.
2009	Wind Energy	Ecological Impact Assessment of the new Tocha's Wind Farm, Portugal. Portugal.
2009	Fisheries	Ecological Impact Assessment of the professional fishing facilities in São Jacinto, Ria de Aveiro, Portugal. Portugal.
2009	Roads	Non-flying terrestrial vertebrates Monitoring at the A4 Highway, Transmontana Sublease between Vila Real and Bragança, Portugal (pre-construction and construction phases). Portugal.
2009	Electric sector	Ecological Impact Assessment of the power line between Vila Pouca de Aguiar - Ribeira de Pena – Carrapatelo (400 Kv), Portugal. Portugal.
2008	Nature Conservation	Development of the WebGIS Biodiversity Tracking System tool. Portugal.
2008	Offshore Energy	Ecological Impact Assessment of the FLOW Project, a Martifer Energia's wave energy pilot-project, Portugal. Portugal.
2008	Roads	Ecological section of the Preliminary Environmental Compliance Report study for the conception, construction and operation of the Douro Interior Highway Sublease, Portugal. Portugal.
2008	Wind Energy	Ecological diagnosis for the potential construction of a Wind Farm in Facho da Azóia, Portugal. Portugal.
2008	Electric sector	Bird monitoring at the Mogadouro-Valeira high tension power line to the Olmos substation (220 kV) in Macedo de Cavaleiros, Portugal (pre-construction and construction phase). Portugal.
2008	Roads	Ecological section of the Preliminary Environmental Compliance Report for the conception, construction and operation of the Baixo Alentejo Highway Sublease, Portugal. Portugal.
2008	Wind Energy	Ecological diagnosis for the potential construction of Montejunto's Wind Farm, Portugal. Portugal.
2008	Roads	Tree mapping at the main road IC17 - CRIL, Portugal. Portugal.
2008	Roads	Ecological Impact Assessment and Environmental Compliance Report of the Highway A32/IC2 expansion - Gaia-Oliveira de Azeméis connection, Portugal. Portugal.
2008	Roads	Ecological section of the Preliminary Environmental Compliance Report for the conception, construction and operation of the Baixo Tejo Highway Sublease, Portugal. Portugal.
2008	Education & Awareness	Environmental Education Activity at Mata da Machada, in Barreiro, Portugal (2005, 2006, 2007 and 2008). Portugal.
2008	Wind Energy	Bird and bat monitoring at Cabeço da Rainha II Wind Farm, Portugal (pre-construction phase, constuction and operation phases). Portugal.
2008	Wind Energy	Bird and flora monitoring at São Bento wind farm, Portugal (pre-construction phase). Portugal.
2008	Wind Energy	Baseline ecological study at São Bento wind farm, Portugal (pre-construction phase). Portugal.
2008	Training	Course on Introduction to the Geographic Information Systems, SPEA, Lisbon, Portugal (2007 and 2006). Portugal.
2008	Wind Energy	Bird monitoring at Bravo and Mougueiras Wind Farms, Portugal (construction and operation phases). Portugal.
2008	Wind Energy	Bird, including Montagu's Harrier, and flora monitoring at Caramulo's Wind Farm, Portugal (pre-construction, construction and operation phases). Portugal.
2008	Agriculture	Ecological Impact Assessment of Redonda's Dam, Portugal. Portugal.
2008	Wind Energy	Baseline ecological study of Baixo Alentejo Wind farm, Portugal. Portugal.
2008	Wind Energy	Birds and bats monitoring at Mértola and Santa Cruz wind farms, Portugal (pre-construction phase). Portugal.
2008	Wind Energy	Ecological section of the environmental conformity report for the Mértola wind farm, Portugal. Portugal.
2008	Wind Energy	Ecological section of the environmental conformity report for the Santa Cruz wind farm, Portugal. Portugal.
2008	Wind Energy	Bird and bat monitoring at Montalegre and Facho-Colmeia Wind Farms, Portugal (pre-construction, construction and operation phases). Portugal.
2008	Electric sector	Ecological Impact Assessment of the the very high tension power line (400 kV) between Fernão Ferro - Palmela and the expansion of Fernão Ferro's substation, Portugal. Portugal.
2008	Roads	Ecological section of the Preliminary Environmental Compliance Report for the conception, construction and operation of the Litoral Oeste Highway Sublease, Portugal. Portugal.

2008	Roads	Ecological section of the Preliminary Environmental Compliance Report for the conception, construction and operation of the Centre Highway Sublease, Portugal. Portugal.
2008	Tourism	Ecological Impact Assessment of a touristic development in Vale do Alecrim, Portugal. Portugal.
2008	Transports	Ecological section of the Preliminary Environmental Compliance Report of the high-speed train (TGV), between Poceirão and Caia, Portugal. Portugal.
2008	Wind Energy	Bird and bat monitoring at Carreço-Outeiro II Wind Farm, Portugal (pre-construction, construction and operation phases). Portugal.
2008	Tourism	Ecological advisory on the viability of Herdade do Pontal touristic development to be located at Ria Formosa Natural Park, Portugal. Portugal.
2008	Roads	Fauna and flora monitoring of the A4 Highway between Amarante and Vila Real, Portugal (pre-construction phase). Portugal.
2008	Maritime	Ecological Impact Assessment of the Aveiro Port's pier extension, Portugal. Portugal.
2008	Transports	Ecological Impact Assessment of Oporto's underground expansion to Gondomar, Portugal. Portugal.
2008	Roads	Ecological Impact Assessment of the alternative road to Trofa, Portugal. Portugal.
2008	Roads	Ecological Impact Assessment of the main roads IC6, IC7 and IC37, Portugal. Portugal.
2008	Oil & Gas	Flora and vegetation monitoring at the Carriço-Leirosa-Lares gas pipeline, Portugal (construction phase). Portugal.
2008	Wind Energy	Ecological Impact Assessment of a Wind Farm to be built in Tavira, Portugal. Portugal.
2008	Industry	Ecological Impact Assessment of an Aeronautic Industrial Development Project in Évora, Portugal. Portugal.
2008	Electric sector	Ecological Impact Assessment of the Mogadouro substation, Portugal. Portugal.
2008	Tourism	Ecological valuing project for the touristic development of Quinta de Santo António, Portugal. Portugal.
2008	Roads	Ecological section of the Preliminary Environmental Compliance Report for the conception, construction and operation of the Algarve Litoral Highway Sublease, Portugal. Portugal.
2008	Other	Ecological Impact Assessment for the stabilization of the Mondego River between the dam-bridge and the Portela Bridge, Portugal. Portugal.
2007	Nature Conservation	Development and management of the WebGIS platform Biodiversity Database for Portugal. Portugal.
2007	Nature Conservation	Development and maintenance of the mapserver for the TRANSMAP project "Transboundary networks of marine protected areas for integrated conservation and sustainable development: biophysical, socio-economic and governance assessment in East Africa" (http://. Portugal.
2007	Land Management	Ecological advisory on the public discussion related to Ria Formosa Natural Park's Land Planning Project, Portugal. Portugal.
2007	Roads	Cabrera's vole (Microtus cabrerae) survey at the construction area of the national roads EN218 and EN221, Portugal. Portugal.
2007	Urban	Ecological Impact Assessment of the the Portalegre Shopping Centre, Portugal. Portugal.
2007	Training	Course on Introduction to the Geographic Information Systems (LPN, Lisbon, Portugal). Portugal.
2007	Wind Energy	Bird and flora monitoring at Lousã II wind farm, Portugal (pre-construction, construction and operation phases). Portugal.
2007	Wind Energy	Bird (pre-construction, construction and operation phases) and flora (construction and operation phases) monitoring at São Macário Wind Farm, Portugal. Portugal.
2007	Land Management	Design of the Land Management Plan of the Hunting Area of Moita and Vila Nova de Monsarros, Portugal (Proc. nº 928 DGRF): procedure for a license renewal. Portugal.
2007	Wind Energy	Ecological Impact Assessment of Mosqueiros II Wind Farm, Portugal. Portugal.
2007	Wind Energy	Ecological Impact Assessment of Colmeia's Wind Farm, Portugal. Portugal.
2007	Wind Energy	Ecological Impact Assessment of Montalegre's Wind Farm, Portugal. Portugal.
2007	Electric sector	Ecological Impact Assessment of the power line between Armamar and Recarei, Portugal. Portugal.
2007	Hydric Energy	Ichthyofauna and pyrenean desman monitoring at the Rebordelo-Bouçoais Dam (Small Hydro), Portugal. Portugal.
2007	Hydric Energy	Ichthyofauna monitoring at Janeiro de Baixo Dam (Small Hydro), Portugal. Portugal.
2007	Wind Energy	Implementation of the mitigation plan for the environmental impact assessment of Sabugal wind farm and its power line – project for the construction of a scavenger birds feeder in Nave de Haver, Sabugal, Portugal. Portugal.
2007	Wind Energy	Ecological Impact Assessment of Malhanito Wind Farm, Portugal. Portugal.
2007	Wind Energy	Ecological Impact Assessment of Mezas, Fóios and Monte Vermelho Wind Farms, Portugal. Portugal.
2007	Wind Energy	Ecological Preliminary Assessment for the construction of Monte da Cumeada Wind Farm, Portugal. Portugal.
2007	Hydric Energy	Ichtyofauna, macroinvertebrates, pyrenean desman, herpetofauna, bird and flora monitoring at Ferradosa, Olgas, Pretarouca and Sambade Dams, Portugal (construction and operation phases). Portugal.
2007	Agriculture	Ecological Impact Assessment of the water channel between Pisão and Beja inserted in the Alqueva

		Irrigation System (EFMA, Portugal). Portugal.
2007	Transports	Terrestrial vertebrates monitoring at REFER's railway between Santo Tirso and Guimarães and between Cete and Caíde, Portugal. Portugal.
2007	Education & Awareness	“Live Science Programme – Biology in the Summer Workshop” in partnership with the Environmental Biology Centre of the Faculty of Sciences of the University of Lisbon (Portugal): cork production and its beneficial effect in the fight against climate change. Portugal.
2007	Agriculture	Ecological section of the Environmental Compliance Report of the water channel Pisão-Roxo inserted in the Alqueva Irrigation System (EFMA, Portugal). Portugal.
2007	Electric sector	Design and implementation of the mitigation plan for the Environmental Impact Assessment of the Mogadouro–Valeira power line and the Olmos (Macedo de Cavaleiros, Portugal) substation, at 220 kV. Portugal.
2007	Electric sector	Ecological Impact Assessment of the power line between Vila Nova and Riba-d'Ave, Portugal. Portugal.
2007	Land Management	Ecological section of the Land Management Plan of the Ermal’s dam reservoir, Portugal. Portugal.
2007	Electric sector	Ecological Impact Assessment of ENEOP2’s power line between Armamar and Valeira, 220kV, Portugal. Portugal.
2007	Tourism	Ecological Impact Assessment of a touristic development in Vila Formosa, Odemira, Portugal. Portugal.
2007	Industry	Ecological Impact Assessment of a tissue paper Industrial Unit to be built in Chamusca, Portugal. Portugal.
2007	Wind Energy	Bird and bat monitoring at Guarda II Wind Farm, Portugal (pre-construction and operation phase). Portugal.
2007	Wind Energy	Bird, bat, flora and vegetation monitoring at Alto Minho Wind Farm, Portugal (Picos, Alto do Corisco and Santo António sub-farms) (pre-construction and operation phases). Portugal.
2007	Maritime/ Ports	Ecological Impact Assessment of the third bridge over the Tagus River and the bridge connecting Seixal to Barreiro, Portugal. Portugal.
2007	Roads	Ecological Impact Assessment of the alternative national road section of EENN 302-303 between Vila Nova de Cerdeira and Paredes de Coura, Portugal. Portugal.
2007	Water treatment	Ecological Impact Assessment of a water treatment plant in Vale do Ave, Portugal. Portugal.
2007	Roads	Ecological section of the Preliminary Environmental Compliance Report study for the conception, construction and operation of the A4 Highway, between Amarante and Vila Real, Portugal. Portugal.
2007	Hydric Energy	Ecological section of the Preliminary Environmental Compliance Report for the construction of Baixo Sabor Dam, Portugal (hydroelectric power station). Portugal.
2007	Wind Energy	Bird monitoring at Mastro’s Wind Farm, Portugal (operation phase). Portugal.
2007	Agriculture	Wintering bird monitoring in the Alqueva-Pedrógão area in 2007-2008 inserted in the Alqueva Irrigation System (EFMA, Portugal). Portugal.
2007	Agriculture	Design of the Mediterranean Temporary Lagoons Conservation Plan for the Alqueva Irrigation System (EFMA, Portugal). Portugal.
2006	Hydric Energy	Ecological Impact Assessment of the Janeiro de Baixo Dam, Portugal (hydroelectric power station). Portugal.
2006	Agriculture	Ecological Impact Assessment of the Sorraia River Dam, Portugal. Portugal.
2006	Agriculture	Ecological Impact Assessment of the Ferreira-Valbom irrigation areas inserted in the Alqueva Irrigation System (EFMA, Portugal). Portugal.
2006	Roads	Vegetation asssessment in IC17 - CRIL highway. Portugal.
2006	Agriculture	Ecological Impact Assessment and Environmental Compliance report relative to the Execution Plan of Balsemão River’s Dam, Portugal. Portugal.
2006	Urban	Ecological Impact Assessment of Algoz’s Industrial Area, Portugal. Portugal.
2006	Wind Energy	Bird, flora and vegetation monitoring at Moradal/Proença Wind Farm, Portugal (pre-construction, construction and operation phases). Portugal.
2006	Industry	Ecological Impact Assessment of Gavião’s Industrial Area, Portugal. Portugal.
2006	Agriculture	Ecological Impact Assessment of the Alfundão irrigation area inserted in the Alqueva Irrigation System (EFMA, Portugal). Portugal.
2006	Tourism	Mapping of the tree cover at Chão do Golfe, Golf Academy, Portugal. Portugal.
2006	Wind Energy	Ecological diagnosis for the potential construction of four wind farms in northern and centre Portugal. Portugal.
2006	Industry	Ecological Impact Assessment of Portalegre’s Industrial Park, Portugal. Portugal.
2006	Wind Energy	Ecological Impact Assessment of Chão Falcão III Wind Farm, Portugal. Portugal.
2006	Wind Energy	Bird, bat and wolf monitoring at Sabugal Wind Farm, Portugal (pre-construction phase). Portugal.
2006	Transports	Terrestrial vertebrates Monitoring at REFER's Minho railway, Portugal (operation phase). Portugal.
2006	Transports	Terrestrial vertebrates monitoring at REFER's southern railway between Pragal/Pinhal Novo and km 94/Funcheira, Portugal (operation phase). Portugal.
2006	Education &	Environmental Awareness Program under the Live Science - Biology in the summer, in partnership with

	Awareness	the Centre for Environmental Biology, Faculty of Sciences, University of Lisbon, Portugal. Portugal.
2006	Wind Energy	Bird monitoring at Perdigão Wind Farm, Portugal (pre-construction, construction and operation phases). Portugal.
2006	Tourism	Ecological Impact Assessment of Ponta do Pargo's Golf Course, Madeira, Portugal. Portugal.
2006	Transports	Ecological Impact Assessment of the expansion of Lisbon's (Portugal) underground red line between S. Sebastião and Campolide and yellow line between Rato and Estrela. Portugal.
2006	Maritime/ Ports	Ecological Impact Assessment of the Terreiro do Paço Transportation Terminal, Portugal. Portugal.
2006	Tourism	Ecological Impact Assessment of Sintra's Golf & Country Club, Portugal. Portugal.
2006	Wind Energy	Bird monitoring at Zibreiro Wind Farm, Portugal (pre-construction phase). Portugal.
2006	Maritime/ Ports	Ecological Impact Assessment of Lisbon's new container Port Terminal, Portugal. Portugal.
2006	Electric sector	Ecological Impact Assessment of Armamar's substation and deviation of its associated power lines, Portugal. Portugal.
2006	Agriculture	Design of the steppe bird monitoring programme to be included in the Environmental Impact Assessment of the Alvito-Pisão irrigation areas inserted in the Alqueva Irrigation System (EFMA, Portugal). Portugal.
2006	Wind Energy	Ecological Impact Assessment of Lomba do Vale Wind Farm, Portugal. Portugal.
2006	Wind Energy	Flora monitoring at Gardunha Wind Farm's power line, Portugal (pre-construction phase). Portugal.
2005	Tourism	Ecological Impact Assessment of the touristic development in Cal Island, Porto Santo, Madeira, Portugal. Portugal.
2005	Transports	Ecological Impact Assessment for the high-speed train (TGV), sector 3C between Évora, Portugal, and the national border). Portugal.
2005	Roads	Ecological Impact Assessment of the national road EN221 and the alternative road to Escalhão, Portugal. Portugal.
2005	Water treatment	Ecological Impact Assessment of Barreiro's water treatment plant, Portugal. Portugal.
2005	Hydric Energy	Design of the Biodiversity Monitoring Programme for the Ferradosa Dam, Portugal. Portugal.
2005	Wind Energy	Baseline Ecological Assessment for the potential construction of Vale Grande Wind Farm, Portugal. Portugal.
2005	Electric sector	Ecological Impact Assessment of the Alqueva substation (EFMA, Portugal). Portugal.
2005	Wind Energy	Ecological clerk of works during the construction of Alto Minho I Wind Farm's power lines, Portugal. Portugal.
2005	Nature Conservation	Flora inventory at Óbidos' lagoon (Portugal) – Assessment to be included in the proposal for it's classification as a regional protected area. Portugal.
2005	Transports	Ecological Impact Assessment of Coimbra's Intermodal Complex, Portugal. Portugal.
2005	Land Management	Ecological section of the environmental incidences study for Setubal's POLIS programme, Portugal. Portugal.
2005	Wind Energy	Ecological section of the environmental incidences study for Felgar wind farm, Portugal. Portugal.
2005	Extraction sector	Ecological section of the management and sand extraction plan for the River Mondego's and Vouga's drainage basins. Portugal.
2005	Agriculture	Fauna and flora specialist studies to be integrated in the Environmental Impact Assessment of the irrigation areas of Alvito-Pisão inserted in the Alqueva Irrigation System (EFMA, Portugal). Portugal.
2005	Tourism	Habitat mapping to be included in the Environmental Impact Assessment of the camping sites located at Arriba Fóssil da Costa da Caparica Protected Area, Portugal. Portugal.
2005	Hydric Energy	Ecological section of the Environmental Compliance Report for the Vales Dam, Portugal. Portugal.
2005	Wind Energy	Habitat mapping to be included in the Environmental Impact Assessment of Serra de Candeeiros II Wind Farm, Portugal. Portugal.
2005	Nature Conservation	Final report of the red-billed chough (Pyrrhocorax pyrrhocorax) monitoring at Serra de Candeeiros' south ridge area, Portugal. Portugal.
2005	Tourism	Advisory on the implementation of the biodiversity monitoring plans associated to the Porto Santo golf course, Madeira, Portugal. Portugal.
2005	Education & Awareness	"Live Science Programme – Biology in the Summer Workshop" in partnership with the Environmental Biology Centre of the Faculty of Sciences of the University of Lisbon (Portugal): water in the Mediterranean ecosystems – the example of the cork woodland at Grândola's mountain. Portugal.
2005	Electric sector	Ecological Impact Assessment of the National Network for Energy Transportation International Douro river, Portugal. Portugal.
2005	Wind Energy	Bird and flora monitoring at Pinhal do Interior Wind Farm, Portugal (pre-construction, construction and operation phases). Portugal.
2005	Wind Energy	Bird monitoring at Monção Wind Farm site (Portugal) and design of the Monitoring Programme to be integrated in the project's Environmental Compliance Report. Portugal.
2005	Roads	Fauna and flora monitoring at A28/IC1 Highway, between Viana do Castelo-Caminha and at A27/IP9 Highway - Ponte de Lima, Portugal (pre-construction phase). Portugal.

2005	Agriculture	Ecological Impact Assessment and design of the monitoring programmes for Sambade Dam, Portugal. Portugal.
2005	Wind Energy	Ecological Impact Assessment of the Lousã II Wind Farm, Portugal. Portugal.
2005	Wind Energy	Baseline Ecological Assessment on Black Vulture (Aegypius monachus) at Sabugal Wind Farm site, Portugal (pre-construction phase). Portugal.

Others projects

2005	Environmental education	Environmental education project "Environmental Awareness Program in the context of the Living Science Program - Summer Biology, in partnership with the Environmental Biology Center of the Sciences Faculty of the University of Lisbon (Portugal): Water in Mediterranean ecosystems - the example of the cork oak forest Grandola". Portugal.
2005	Electric Sector	Monitoring project "Biological monitoring of the construction of the electric lines of the Alto Minho I Wind Farm I". Portugal.
2005	Tourism	Monitoring project "Assistance to the implementation of the biological monitoring plans of the Porto Santo Golf Course". Portugal.
2005	Wind Energy	Monitoring project "Characterization of the avifauna in the Alto do Monção Wind Farm (Portugal) and preparation of the respective monitoring plan to be included in the Environmental Compliance Report of the Implementation Project (RECAPE)". Portugal.
2005	Wind Energy	EIA project "Habitat cartography for the Environmental Impact Study of the Serra de Candeeiros II Wind Farm". Portugal.
2005	Tourism	EIA project "Cartography of habitats for the Environmental Impact Study of campsites located in the Protected Landscape of Arriba Fossil of Costa da Caparica". Portugal.
2005	Extraction sector	Management Plan project "Ecology component of the Management Plan for Inert Extraction of the Vouga and Mondego Basins". Portugal.
2005	Wind Energy	EIA project "Ecology component of the Environmental Impact Study of the Felgar Wind Farm". Portugal.
2005	Wind Energy	EIA project "Ecology component of the Environmental Impact Study of the Lousã II Wind Farm". Portugal.
2005	Electric Sector	EIA project "Ecology component of the Environmental Impact Study of the Modification of the National Transport Network in the Douro International Zone". Portugal.
2005	Hydric Energy	Environmental Conformity project "Ecology component of the Environmental Compliance Report of the Implementation Project (RECAPE) of the Vales Hydroelectric Plant". Portugal.
2005	Hydric Energy	EIA project "Ecology component of the Environmental Impact Study of Sambade, Portugal, and elaboration of the monitoring plans". Portugal.
2005	Transports	EIA project "Ecology component of the Environmental Impact Study of the high-speed rail line (TGV) - Lot 3C". Portugal.
2005	Roads	EIA project "Ecology component of the Environmental Impact Study of EN221 and Escalhão variant". Portugal.
2005	Agriculture	EIA project "Ecology component of the Environmental Impact Study of the Alqueva Substation". Portugal.
2005	Agriculture	EIA project "Ecology component of the reference situation of the Environmental Impact Study of the Alvito-Pisão Irrigation Blocks associated to the Alqueva Multiple Purpose Project". Portugal.
2005	Tourism	EIA project "Ecology component of the Study of Environmental Impact of the Tourist Resort of Ilhéu da Cal, Porto Santo". Portugal.
2005	Urban	EIA project "Ecology component of the Environmental Incidents Study of the Setubal POLIS Program ". Portugal.
2005	Water treatment	EIA project "Ecology component of the Environmental Impact Study of the Barreiro Wastewater Treatment Plant". Portugal.
2005	Extraction sector	EIA project "Ecology component of the Management Plan for Inert Extraction of the Vouga and Mondego Basins". Portugal.
2005	Wind Energy	Baseline Assessment project "Ecological Base Study on Black Vulture (Aegypius monachus) in the area of the Sabugal Wind Farm (pre-construction phase)". Portugal.
2005	Wind Energy	Monitoring project "Elaboration of the final report on the monitoring of the red-legged crow (Pyrrhocorax pyrrhocorax) in the southern part of the mountain range of Serra dos Candeeiros". Portugal.
2005	Hydric Energy	Monitoring Plan Design project "Biodiversity monitoring plan elaboration in the Ferradosa Hydroelectric Plant". Portugal.
2005	Wind Energy	Baseline Assessment project "Ecological Base Study of the Vale Grande Wind Farm". Portugal.
2005	Nature Conservation	Baseline Assessment project "Flora inventory in Óbidos Lagoon - Study to be included in the proposal to classify the Lagoa as a Regional Protected Landscape Area". Portugal.
2005	Wind Energy	Monitoring project "Avifauna and flora monitoring in the Pinhal Interior Wind Farm (pre-construction, construction and exploration phase)". Portugal.
2005	Environmental education	Environmental education project "Guided visits to students of Basic Education - Ecological Strand of the Grândola Mountain Range for the Grândola Municipal Council". Portugal.
2005	Transports	Baseline Assessment project "Reference situation of the ecology component of the Study of Environmental Incidents of the Coimbra Intermodal Complex". Portugal.

+ Training

2010	EIA	"Framework of the Environmental Impact Assessment (EIA) and Environmental Consulting in Mozambique" Workshop by Portuguese Association of Impact Assessment . 10 Feb, 2010. Lisbon, Portugal.
2009	Leadership	"Executive coaching for leaders" Course by International School of Professional Coaching . 29 Oct a 30 Oct, 2009. Lisbon, Portugal.
2009	Sampling techniques	"Training and Accreditation in the River Habitat Survey (RHS)" Course by Water National Institute . 20 Apr a 23 Apr, 2009. Vila Real, Portugal.
2009	Sampling technologies	"Merlin Avian Radar System Training Class for Wind Energy & Environmental Projects" Course by Detect Inc . 2 Feb a 5 Feb, 2009. Florida, USA.
2008	Sampling techniques	"Dog training for birds and bats corpses search and detection" Course by Cinotech Technical Group of the Public Security Police Special Unit . 1 - 1 Apr, 2008. , Portugal.
2008	Finance	"Finance for managers and non-financiers" Course by Higher Institute of Economics and Business . 11 - 5 Feb, 2008. Lisbon, Portugal.
2007	Project Management	"Project Management for Executives " Course by Higher Institute of Business . 29 - 21 Jan, 2007. Lisbon, Portugal.
2004	EIA	"Development and implementation of bioindicators in impact assessment and biodiversity monitoring schemes" Course by Zoology Department of Coimbra University . 20 Sep a 30 Sep, 2004. Coimbra, Portugal.
2004	Environment Law	"Initiation to the Environment Legal Order " Course by Liga para a Protecção da Natureza . 26 Jan a 31 Jan, 2004. Lisbon, Portugal.
2003	Flora ID	"Flora and Mediterranean vegetation" Course by Sciencies Faculty of University of Lisbon - Plant Biology Department . 25 Apr a 30 Apr, 2003. Lisbon, Portugal.

+ Publications

2018	Book Chapter | Wind Energy Impacts	Santos, J., Marques, J., Neves, T., Marques, A.T., Ramalho, R., Mascarenhas, M. (2018). Environmental Impact Assessment Methods: An Overview of the Process for Wind Farm's Different Phases – From Pre-Construction to Operation. In: Mascarenhas, M., Marques, A.T., Ramalho, R., Santos, D., Bernardino, J., Fonseca, C. (Eds). Biodiversity and Wind Farms in Portugal: Current Knowledge and Insights for an Integrated Impact Assessment Process, pp. 35-86. Springer International Publishing.
2018	Book Chapter | Wind Energy Impacts	Rodrigues, S. , Rosa, L., Mascarenhas, M. (2018). An Overview on Methods to Assess Bird and Bat Collision Risk in Wind Farms. In: Mascarenhas, M., Marques, A.T., Ramalho, R., Santos, D., Bernardino, J., Fonseca, C. (Eds). Biodiversity and Wind Farms in Portugal, pp. 87-110. Springer International Publishing.
2018	Book Chapter | Wind Energy Impacts	Marques, J., Rodrigues, S., Ferreira, R., Mascarenhas, M. (2018). Wind Industry in Portugal and Its Impacts on Wildlife: Special Focus on Spatial and Temporal Distribution on Bird and Bat Fatalities. In: Mascarenhas, M., Marques, A.T., Ramalho, R., Santos, D., Bernardino, J., Fonseca, C. (Eds). Biodiversity and Wind Farms in Portugal, pp. 1-22. Springer International Publishing.
2018	Book Chapter | Wind Energy Impacts	Paula, J., Augusto, M., Neves, T., Bispo, R., Cardoso, P., Mascarenhas, M. (2018). Comparing Field Methods Used to Determine Bird and Bat Fatalities. In: Mascarenhas, M., Marques, A.T., Ramalho, R., Santos, D., Bernardino, J., Fonseca, C. (Eds). Biodiversity and Wind Farms in Portugal. Springer International Publishing.
2018	Book chapter | Wind Energy Impacts	Coelho, H., Mesquita, S., Mascarenhas, M. (2018). How to Design an Adaptive Management Approach? In: Biodiversity and Wind Farms in Portugal - Current knowledge and insights for an integrated impact assessment process. Editors: Mascarenhas, M., Marques, A.T., Ramalho, R., Santos, D., Bernardino, J., Fonseca, C. (Eds.). Chapter 8 - Pages 205-224. Springer Book.
2017	Oral Presentation | Statistics & Ecology	Cláudio, N., Rodrigues, S., Mascarenhas, M., Mouriño, H., Marques, T.A. (2017). Classificação automática de sons de morcegos [Automatic identification of bat sounds]. Congresso da Sociedade Portuguesa de Estatística. 18 to 21 de October 2017. Lisbon, Portugal.[in Portuguese]
2017	Oral presentation | Wind Energy Impacts	Coelho, H., McLean, N., Mascarenhas, M., Pendlebury, C. (2017). Experiences gained from delivery of offshore wind energy in the UK that could inform the environmental assessment of Portuguese projects. 4th Conference on Wind energy and Wildlife impacts (CWW). 6 to 8 September 2017. Estoril, Portugal.
2017	Poster | Wind energy Environ. Assessment	Mascarenhas, M., Coelho, H., Sá da Costa, A. (2017). Wind farms aren't the same concept to all of us? So what are they? 4th Conference on Wind energy and Wildlife impacts (CWW). 6 to 8 september 2017. Estoril, Portugal.
2017	Poster | Wind energy Environ. Assessment	Tidhar, D., Mascarenhas, M., Coelho, H., McLean, N. (2017). How to reduce uncertainty using a question based approach for universal wind energy assessment. 4th Conference on Wind energy and Wildlife impacts (CWW). 6 to 8 september 2017. Estoril, Portugal.
2017	Poster | Wind Energy Impacts	Mesquita, S., Coelho, H., Mascarenhas, M. (2017). Adding value to wind farm projects by integrating ecosystem services in the environmental impact assessment process. 4th Conference on Wind energy and Wildlife impacts (CWW). 6 to 8 september 2017. Estoril, Portugal.
2017	Poster | Wind	Mesquita, S., Coelho, H., Mascarenhas, M. (2017). Call for action: Adaptive management in practice. 4th

	energy Environ. Assessment	Conference on Wind energy and Wildlife impacts (CWW). 6 to 8 september 2017. Estoril, Portugal.
2017	Oral Presentation | Wind Energy Impacts	Marques, J., Rodrigues, S., Mascarenhas, M. (2018). Is Bird Fatality driven by environmental features? A spatial model for Portugal. 4th Conference on Wind energy and Wildlife impacts (CWW). 6 to 8 september 2017. Estoril, Portugal.
2017	Poster | Ecology	Rodrigues, S., Marques, J., Coelho, H., Mascarenhas, M. (2017). Bat nightly and seasonal activity patterns at height: A cross country comparison and insights into conservation. 4th Conference on Wind energy and Wildlife impacts (CWW). 6 to 8 september 2017. Estoril, Portugal.
2017	Poster | Wind Energy Impacts	Marques, J., Rodrigues, S., Mascarenhas, M. (2017). Bird behavioural response to the surrounding environment: a specific approach to wind farm location and placement. 4th Conference on Wind energy and Wildlife impacts (CWW 2017). 6 to 8 september 2017. Estoril, Portugal.
2017	Oral presentation | Wind Energy Impacts	Santos, J., Rosa, L., Mascarenhas, M. (2017). Mitigation strategies & effectiveness - the Candeeiros wind farm monitoring and mitigation program case study. 4th Conference on Wind energy and Wildlife impacts (CWW 2017). 6 to 8 september 2017. Estoril, Portugal.
2017	Poster | Ecology	Santos, J., Ferreira, A.C., Mascarenhas, M., Reis, C. (2017). Local stakeholders' involvement on offset/compensation projects: What is their role and how they matter for sustainability? 4th Conference on Wind energy and Wildlife impacts (CWW 2017). 6 to 8 september 2017. Estoril, Portugal.
2017	Oral presentation | Wind Energy Impacts	Rosa, L., Paula, J., Mascarenhas, M. (2017).Camera-trapping as a methodology in the assessment of carcass persistence, used in bird and bat fatality estimates at wind farms.
2016	Oral Presentation | Wind Energy Impacts	Mesquita, S., Marques, J., Rodrigues, S., Cordeiro, A., Mascarenhas, M., Ramalho, R., Costa, C., Ferreira, M. (2016). Mitigação de impactes dos parques eólicos em quirópteros minimizando perdas de produção: dois casos de estudo de adequação da velocidade de arranque das turbinas [Mitigation of wind farm impacts in bats and production loss minimization: two study cases of optimization of turbine cut-in speed]. 6ª Conferência Nacional de Avaliação de Impactes (CNAI). University of Évora, 19 to 21 May 2016. Évora, Portugal. [in Portuguese]
2016	Paper | Bat Conservation	Pereira, M.J.R., Peste, F., Paula, A., Pereira, P., Bernardino, J., Vieira, J., Bastos, C., Mascarenhas, M., Costa, H., Fonseca, C. (2016). Managing coniferous production forests towards bat conservation. Wildlife Research 43(1):80-92. http://dx.doi.org/10.1071/WR14256
2015	Oral Presentation | Wind Energy Impacts	Marques, A.T., Batalha, H., Rodrigues, S., Costa, H., Pereira, M.J., Fonseca, C., Mascarenhas, M., Bernardino, J. 2014. Understanding Bird Collisions at Wind Farms: An Updated Review on the Causes and Possible Mitigation Strategies. International Synopsis on Wind Energy and Wildlife. 10 Nov 2015, Berlin.
2015	Paper | Sampling methodologies	Paula, J., Bispo, J.S., Regina, M.B., Leite, A.H., Pereira, P., Costa, H., Fonseca, C., Mascarenhas, M., Bernardino, J. (2015) Camera-trapping as a methodology to assess the persistence of wildlife carcasses resulting from collisions with human-made structures. Wildlife Research 41(8):717-725.
2015	Paper | Wind Energy Impacts	Peste, F., Paula, A., da Silva, L.P., Bernardino, J., Pereira, P., Mascarenhas, M., Costa, H., Vieira, J., Bastos, C., Fonseca, C., Ramos Pereira, M.J. (2015). How to mitigate impacts of wind farms on bats? A review of potential conservation measures in the European context. Environmental Impact Assessment Review 51:10-22.
2015	Oral presentation | Mitigation	Mascarenhas, M. (2015). Wind & Biodiversity Project: fostering synergies to understand and mitigate wind energy impacts. Wind & Biodiversity Seminar. 15th January, 2015. Aveiro, Portugal.
2015	Book | Wind Energy Impacts	Mascarenhas, M., Bernardino, J., Paula, A., Costa, H., Bastos, C., Cordeiro, A., Marques, A., Marques, J., Mesquita, S., Paula, J., Pereira, M., Peste, F., Ramalho, R., Rodrigues, S., Santos, J., Veira, J., Fonseca, C. 2015. Biodiversity & Wind Energy: A Bird's and Bat's Perspective. ed. Aveiro, Portugal: Bio3 e Universidade de Aveiro, 2015, p. 30-52.
2015	Poster | Wind Energy Impacts	Marques, A.T. , Batalha, H., Rodrigues, S., Costa, H., Ramos Pereira, M.J., Fonseca, C., Mascarenhas, M., Bernardino, J. (2015). Unraveling the causes of bird mortality with wind turbines: what do we know so far? Wind energy and Wildlife impacts. CWW 2015. 10 to 12 March, 2015. Berlin, Germany. [Best poster award]
2015	Oral presentation | Wind Energy Impacts	Bispo, R., Bernardino, J., Paula, J., Marques, T., Costa, H., Mascarenhas, M. (2015). Enhancing the study design of carcass removal trials for bats and birds at wind farms. Wind energy and Wildlife impacts. 10th to 12th March 2015. Berlin, Germany.
2014	Proceedings | Wind Energy	Correia, R., Vieira, J., Faneca, C., Albuquerque, D., Bastos, C., Costa, H. Bernardino, J., Mascarenhas, M., Pereira, M.J., Fonseca, C., Inácio, O. (2014). Characterization of the ultrasonic acoustic field of a wind turbine. In Proceedings of TecniAcoistica 2014. Conferencias y Comunicaciones del 45º Congreso Español de Acústica, 8º Congreso Ibérico de Acústica y Simposio Europeo de Ciudades Inteligentes y Acústica Ambiental. 29 to 31 October 2014. Múrcia, Spain.
2014	Oral presentation | Wind Energy Impacts	Bernardino, J., Bispo, R., Paula, J., Costa, H., Mascarenhas, M. (2014). Os desafios da estimação da mortalidade de aves e morcegos em parques eólicos: avanços recentes e novas diretrizes [The challenges of estimating the mortality of birds and bats in wind farms: recent advances and new directions]. 5º Congresso Nacional de Avaliação de Impacte (CNAI). 20 and 21 March 2014. Viseu, Portugal.[in Portuguese]
2014	Paper | Wind Energy Impacts	Marques, A. T., Batalha, H., Rodrigues, S., Costa, H., Pereira, M. J. R., Fonseca, C., Mascarenhas, M., Bernardino, J. 2014. Understanding bird collisions at wind farms: An updated review on the causes and possible mitigation strategies. Biological Conservation, 40-52.
2014	Minutes book | Wind Energy	Bernardino, J., Bispo, R., Paula, J., Costa, H., Mascarenhas, M. (2014). The challenges of estimating the mortality of birds and bats in wind farms: recent advances and new directions. Minutes book of the 5th

	Impacts	National Congress of Impact Assessment. 20 and 21 March 2014. Viseu, Portugal. ISBN: 978-989-96971-1-9.
2014	Minutes book | Wind Energy Impacts	Bernardino, J., Paula, A., Marques, A. T., Peste, F., Pereira, M.J., Fonseca, C., Mascarenhas, M., Costa, H. (2014). Strategies and technologies to minimize the impacts of wind farms on birds and bats: what's the true cost/benefit? Minutes book of the 5th National Congress of Impact Assessment. 20 and 21 March 2014. Viseu, Portugal. ISBN: 978-989-96971-1-9.
2014	Oral presentation | Wind energy	Correia, R., Vieira, J., Faneca, C., Albuquerque, D., Bastos, C., Costa, H. Bernardino, J., Mascarenhas, M., Pereira, M.J., Fonseca, C., Inácio, O. (2014). Characterization of the ultrasonic acoustic field of a wind turbine. TecniAcoustica 2014. 29th to 31st October, 2014. Múrcia, Spain.
2014	Oral presentation | Wind Energy Impacts	Bernardino, J., Bispo, R., Paula, J., Costa, H., Mascarenhas, M. (2014). Os desafios da estimação da mortalidade de aves e morcegos em parques eólicos: avanços recentes e novas diretrizes [The challenges of estimating mortality of birds and bats at wind farms: recent advances and new guidelines]. 5th National Congress of Impact Assessment. 20th to 21st March 2014. Viseu, Portugal. [in Portuguese]
2014	Oral presentation | Wind Energy Impacts	Bernardino, J., Paula, A., Marques, A. T., Peste, F., Pereira, M.J., Fonseca, C., Mascarenhas, M., Costa, H. (2014). Estratégias e tecnologias de minimização de impactes dos parques eólicos nas aves e morcegos: qual a verdadeira relação de custo/benefício? [Wind Farm Impact minimization strategies and technologies for birds and bats: what is the true cost/benefit?]. 5th edition of Congresso Nacional de Avaliação de Impacte CNAI. 20th to 21st March, 2014. Viseu, Portugal. [in Portuguese]
2014	Oral presentation | Agriculture	Marques, A.T., Rosa, I., Palminha, G., Paixão, R., Bernardino, J., Costa, H., Mascarenhas, M. (2014). Caraterização da atividade da avifauna associada à sementeira do arroz, através de um sistema de radar [Characterization of birds associated with rice seed activity, through a radar system]. VIII Congresso de Ornitologia da SPEA. 1st to the 4th of March 2014. Almada, Portugal. [in Portuguese]
2013	Paper | Statistical analysis	Bernardino, J., Bispo, R., Costa, H., Mascarenhas, M. (2013). Estimating bird and bat fatality at wind farms: a practical overview of estimators, their assumptions and limitations. New Zealand Journal of Zoology, 40, 1: 63-74.
2013	Paper | Statistical analysis	Bernardino, J., Bispo, R., Costa, H., Mascarenhas, M. (2013). Estimating bird and bat fatality at wind farms: a practical overview of estimators, their assumptions and limitations. New Zealand Journal of Zoology, 40, 1: 63-74.
2013	Proceedings | Wind Energy Monitoring	Correia, R., Faneca, C., Vieira, J.M.N., Bastos, C., Mascarenhas, M., Costa, H., Bernardino, J., Fonseca, C., Pereira, M.J.R. (2013). Bat Monitoring System for Wind Farms. Proceedings of the 12th Conference on Programmable Devices and Embedded Systems. 25 to 27 September 2013. Velke Karlovice, Czech Republic.
2013	Oral presentation | Wind Energy Impacts	Bernardino, J., Mascarenhas, M., Jodas, K., Thomas, J., Costa, H. (2013). Mitigating and monitoring impacts of wind energy facilities on birds and bats: lessons learnt from the European experience. WINDaba 2013. 25th to 27th September 2013. Cape Town, South Africa.
2013	Oral presentation | Wind Energy Monitoring	Correia, R., Faneca, C., Vieira, J.M.N., Bastos, C., Mascarenhas, M., Costa, H., Bernardino, J., Fonseca, C., Pereira, M.J.R. (2013). Bat Monitoring System for Wind Farms. 12th Conference on programmable devices and embedded systems. 25th to 27th September 2013. Velke Karlovice, Czech Republic.
2013	Oral presentation | Wind Energy Impacts	Passos, I., Silva, M.J., Mesquita, S., Marques, A.T., Bernardino, J., Costa, H., Mascarenhas, M. (2013). Aliens in wind farms - preventing and monitoring impacts on vegetation. Conference on Wind power and Environmental impacts. 5th to the 7th February 2013. Stockholm, Sweden.
2013	Oral presentation | Mitigation & Compensation	Peste, F., Paula, A., Bernardino, J., Costa, H., Mascarenhas, M., Fonseca, C., Pereira, M.J. (2013). Off-site mitigation and compensation measures for bats at wind farms. Conference on Wind power and Environmental impacts. 5th to the 7th February 2013. Stockholm, Sweden.
2013	Oral presentation | Mitigation	Cordeiro, A., Mascarenhas, M., Costa, H. (2013). Long term survey of wind farms impacts on common kestrel´s populations and definition of an appropriate mitigation plan. Conference on Wind power and Environmental impacts. 5th to the 7th February 2013. Stockholm, Sweden.
2012	Poster | Marine renewables impacts	Coelho, H., Ferreira, R., Rodrigues, S., De Silva, R., Pendlebury, C., Walls, R., Mascarenhas, M., Costa, H. (2012). Guidelines for offshore renewables in the Portuguese Pilot Zone based on a pre-construction assessment. NWCC Wind Wildlife Research Meeting IX. 27 to 30 Nov 2012. Denver, Colorado, EUA.
2012	Poster | Marine renewables impacts	Coelho, H., De Silva, R., Ferreira, R., Rodrigues, S., Pendlebury, C., Walls, R., Mascarenhas, M., Costa, H. (2012). Portuguese offshore renewables Pilot Zone – producing environmental guidelines for development. 4th International Conference on Ocean Energy. 17th to 19th October, 2012. Dublin, Ireland.
2012	Oral presentation | Ecology and Conservation	Ferreira, R., Marques, A.T., Zina, H., Santos, J., Silva, M.J., Mascarenhas, M., Costa, H. (2012). Monitorização da Comunidade de Aves Estepárias na ITI de Castro Verde [Steppe bird surveying at Castro Verde]. Seminar "Conservação das Estepes Cerealíferas". 7th and 8th November 2012. Castro Verde, Portugal.
2012	Oral presentation | Monitoring techniques	Faneca, C., Correira, R., Vieira, J., Bastos, C., Fonseca, C., Pereira, M.J., Mascarenhas, M., Costa, H., Bernardino, J. (2012). 3D reconstruction of bat trajectories from stereo vision. 18th Portuguese Conference on Pattern Recognition. 26 October 2012. Coimbra, Portugal.
2012	Proceedings | Marine renewables impacts	Coelho, H., Ferreira, R.; Rodrigues, S., De Silva, R., Pendlebury, C., Walls, R., Mascarenhas, M., Mesquita, S., Costa, H. (2012). First specific biodiversity assessment in the Portuguese Pilot Zone (PPZ). In Proceedings of the 32nd Annual Meeting of International Association for Impact Assessment (IAIA).
2012	Oral Presentation | Marine	Coelho, H., Ferreira, R., Rodrigues, S., De Silva, R., Pendlebury, C., Walls, R., Mascarenhas, M., Costa, H. (2012). First specific biodiversity assessment in the Portuguese Pilot Zone (PPZ). 32nd Annual Conference

	renewables impacts	of the International Association for Impact Assessment (IAIA). Congress Center of Alfândega do Porto, Porto, 27th May to 1st June 2012.
2012	Oral presentation | Compensation & Mitigation	Santos, J., Marques, A. T., Paula, A., Bernardino, J., Mascarenhas, M., Costa, H. (2012). Compensation and off-site mitigation strategies for endangered Bonelli's Eagle populations in Wind Farms. VIIth Polish Wind Energy Association (PWEA) Conference & Exhibition. 22nd to the 23rd May 2012. Warsaw, Poland.
2012	Oral presentation | Mitigation	Santos, J., Marques, A.T., Paula, A., Costa, H., Mascarenhas, M. (2012). Reconciling wind farms with Bonelli's eagle populations using off-site mitigation techniques. 1st Iberian Congress on Wind Energy and Wildlife Conservation. 12th to the 14th January 2012. Jerez de la Frontera, Cadiz, Spain.
2012	Oral presentation | Wind Energy monitoring	Paula, J., Leal, M., Silva, M.J., Mascarenhas, R., Costa, H., Mascarenhas, M. (2012). A new weapon to find birds and bats carcasses in wind farms. 1st Iberian Congress on Wind Energy and Wildlife Conservation. 12th to the 14th January 2012. Jerez de la Frontera, Cadiz, Spain.
2012	Oral presentation | Biology	Ferreira, R., Marques, A.T., Zina, H., Santos, J., Silva, M.J., Mascarenhas, M., Costa, H. (2012). Monitoring the Steppe Bird Community at ITI Castro Verde. In Book of Abstracts from the Seminar "Conservação das Estepes Cerealíferas". 7th and 8th November 2012. Castro Verde, Portugal.
2012	Oral presentation | Ecology	Santos, J.; Marques, A. T.; Paula, A.; Bernardino, J.; Mascarenhas, M., Costa, H. (2012). Compensation and off-site mitigation strategies for endangered Bonelli's Eagle populations in Wind Farms. VIIth Polish Wind Energy Association (PWEA) Conference & Exhibition. 22 to 23 May 2012. Warsaw, Poland.
2012	Oral presentation | Ecology	Santos, J., Marques, A. T., Paula, A., Costa, H., Mascarenhas, M. (2012). Compensatory measures: the compatibility between wind farms and the conservation of the Bonelli's eagle. I Congreso Ibérico de Energía Eólica y Conservación de la Fauna. 12 to 14 january 2012. Jerez de la Frontera, Spain.
2012	Poster | Ecology	Santos, J., Marques, A.T., Paula, A., Mascarenhas, M., Costa, H. (2012). Implementation of compensation and offset measures for large birds of prey. NWCC Wind Wildlife Research Meeting IX. 27 to 30 november 2012. Denver, EUA.
2012	Poster | Ecology	Monteiro, B., Ferreira, R., Santos, J., Marques, A.T., Mascarenhas, M., Costa, H. (2012). Variation in bat activity in Portuguese uplands: effects of wind speed, temperature and moonlight in different biotopes. NWCC Wind Wildlife Research Meeting IX. 27 to 30 november 2012. Denver, EUA.
2012	Poster | Ecology	Monteiro, B., Ferreira, R., Santos, J., Marques, A. T., Mascarenhas, M., Costa, H. (2012). Variation in bat activity in Portuguese uplands: effects of wind speed, temperature and moonlight in different biotopes. I Congreso Ibérico de Energía Eólica y Conservación de la Fauna. 12 to 14 january 2012. Jerez de la Frontera, Spain.
2012	Proceedings | Wind Energy Monitoring	Faneca, C., Correira, R., Vieira, J., Bastos, C., Fonseca, C., Pereira, M.J., Mascarenhas, M., Costa, H., Bernardino, J. (2012). 3D reconstruction of bat trajectories from stereo vision. In Proceedings of the 18th Portuguese Conference on Pattern Recognition. 26 October 2012. Coimbra, Portugal.
2012	Proceedings | Wind Energy Impacts	Bernardino, J., Bispo, R., Mascarenhas, M., Costa, H. (2012). Are we properly assessing bird and bat mortality at onshore wind farms? In Proceedings of the 32nd Annual Meeting of International Association for Impact Assessment (IAIA). 27th May to 1st June 2012. Porto, Portugal.
2012	Proceedings | Road impacts	Paula, J., Mesquita, S., Mascarenhas, M., Costa, H. (2012). SEA of a Road Network Plan: effects on wolf populations. In Proceedings of the 32nd Annual Meeting of International Association for Impact Assessment (IAIA). 27th May to 1st June 2012. Porto, Portugal.
2012	Proceedings | Wind Energy Impacts	Bernardino, J., Zina, H., Passos, I., Costa, H., Pereira, M. J., Fonseca, C., Mascarenhas, M. (2012). Bird and bat mortality at Portuguese wind farms. In Proceedings of the 32nd Annual Meeting of International Association for Impact Assessment (IAIA). 27th May to 1st June 2012. Porto, Portugal.
2011	Oral presentation | Wind Energy Impacts	Paula, A., Santos, J., Cordeiro, A., Costa, H., Mascarenhas, M., Reis, C. (2011). Managing habitat for prey recovery – an off-site mitigation tool for wind farms' impacts on top avian predators. Conference on Wind energy and Wildlife impacts. 2nd to the 5th May 2011. Trondheim, Norway.
2011	Oral presentation | Wind Energy Impacts	Cordeiro, A, Mesquita, S., Marques, A.T., Bernardino, J., Silva, M.J., Mascarenhas, M., Costa, H. (2011). What is the real impact of wind farms on biodiversity? Contribution of follow-up studies for the environmental impact assessment process. VI National Congress on Environmental Impact Assessment. 6th to the 8th April 2011. Albacete, Spain.
2011	Oral presentation | Ecology	Paula, A., Santos, J., Cordeiro, A., Costa, H. M., Mascarenhas, M, Reis, C. (2011). Managing habitat for prey recovery – an off-site mitigation tool for wind farms' impacts on top avian predators. Conference on Wind energy and Wildlife impacts. 2 to 5 May 2011. Trondheim, Norway.
2011	Poster | Ecology	Paula, J., Santos, J., Monteiro, B., Novais, R., Costa, H., Mascarenhas, M. (2011). Distribution and feeding ecology of the European Otter Lutra lutra in the area of influence of the future Alvito dam. X Congreso de la SECEM, 3 to 6 december 2011. Spain.
2011	Paper | Statistical analysis	Bernardino, J., Bispo, R., Torres, P., Rebelo, R., Mascarenhas, M., Costa, H., (2011). Enhancing carcass removal trials at three wind energy facilities in Portugal. In Wildlife Biology in Practice, 7(2): 1-14.
2011	Paper | Sampling methodologies	Paula, J., Leal, M.C., Silva, M.J., Mascarenhas, R., Costa, H., Mascarenhas, M. (2011). Dogs as a tool to improve bird-strike mortality estimates at wind farms. Journal for Nature Conservation, 19(4): 202-208.
2011	Technical magazine | Aquatic monitoring	Mascarenhas, M., Coelho, H. (2011). IFIM: metodologia para determinação do caudal ecológico [IFIM: a method for determining the ecological flow]. Renováveis Magazine 7. [in Portuguese]
2010	Oral presentation | Aquatic impacts	Bernardino, J., Puga, J., Leal, M., Mascarenhas, M., Costa, H., Reis, C. (2010). A Directiva Quadro da Água no contexto de Estudos de Impacte Ambiental de barragens: caso de estudo da barragem do Alvito [The

		Water Directive as a framework of the environmental impact assessment of dams: the case of the Alvito dam]. 4th edition of CNAI "Conferência Nacional de Avaliação de Impactes – Avaliação de Impactes e Energia: Água, Terra, Fogo e Ar?". 20th to the 22nd October 2010. Vila Real, Portugal. [in Portuguese]
2010	Oral presentation | Ecology	Paula, A., Cordeiro, A., Santos, J., Costa, H., Reis C., Mascarenhas, M. (2010). Three Years of Implementation of Compensatory Measures on Impacts on Endangered Species: What is the balance. 12th National Ecology Meeting, 18 to 20 october 2010. Oporto, Portugal.
2010	Oral presentation | Environmental Assessment	Mesquita, S., Bernardino, J., Mascarenhas, M., Costa, H., Roxo, A., (2010). A Avaliação de Planos segundo a Directiva Habitats: uma proposta metodológica [Appropriate Assessment according to the Habitats Directive: a methodological proposal]. 4ª Conferência Nacional de Avaliação de Impactes – Avaliação de Impactes e Energia: Água, Terra, Fogo e Ar? 20th to the 22nd October 2010. Vila Real, Portugal. [in Portuguese]
2010	Oral presentation | Wind Energy Impacts	Cordeiro, A., Mesquita, S., Marques, T., Silva, M.J., Rodrigues, N., Zina, H., Costa, H., Mascarenhas, M., (2010). Avaliação de impactes na componente biológica em parques eólicos: impactes previstos vs. impactes reais [Biological section of environmental impact assessment at wind farms: envisaged impacts vs. actual impacts]. 4th edition of CNAI "Conferência Nacional de Avaliação de Impactes - Avaliação de Impactes e Energia: Água, Terra, Fogo e Ar?" 20th to the 22nd October 2010. Vila Real, Portugal. [in Portuguese]
2010	Oral presentation | Wind Energy Impacts	Marques, T., Ferreira, R., Costa, H., Mascarenhas, M. (2010). Is it necessary to adjust a wind farm layout? How to identify and minimize potential impacts on raptors and soaring birds. Wind Wildlife Research Meeting VIII. 19th to the 21st October 2010. Denver, Colorado, USA.
2010	Oral presentation | Wind Energy Impacts	Marques, A.T, Bernardino, J., Costa, H., Mascarenhas, M. (2010). Following raptors and soaring birds populations in Wind Farms: a methodological protocol. 18th International Conference of the European Bird Census Council, EBCC. 22-26 March 2010. Caceres, Spain.
2010	Oral presentation | Monitoring technologies	Palminha, G., Costa, H., Mascarenhas, M. (2010). Biodiversity tracking system from concept to deployment. Argos user meeting at Bird Migration & Global Change, CLS – Collect Localisation Satellites. 20th March 2010. Algeciras, Spain.
2010	Oral presentation | Impact Assessment	Mesquita, S., Bernardino, J., Marques, T., Mascarenhas, M., Costa, H., (2010). Análise de risco como suporte à avaliação de impactes: metodologias aplicadas a vertebrados terrestres [Risk analysis to support environmental impact assessment: methods applied to terrestrial vertebrates]. 4th edition of CNAI "Conferência Nacional de Avaliação de Impactes – Avaliação de Impactes e Energia: Água, Terra, Fogo e Ar?" 20th to the 22nd October 2010. Vila Real, Portugal. [in Portuguese]
2010	Oral presentation | Wind Energy Monitoring	Marques, A.T., Ferreira, R., Silva, M. J., Bernardino, J., Costa, H., Mascarenhas, M. (2010). Monitorização da comunidade de aves de rapina e planadoras em parques eólicos: uma proposta metodológica [Monitoring of the community of raptors and soaring in wind farms: a methodological proposal]. 12th edition of "Encontro Nacional de Ecologia". 18th to the 20th October 2010. Oporto, Portugal. [in Portuguese]
2010	Oral presentation | Wind Energy Impacts	Paula, A., Cordeiro, A., Santos, J., Costa, H., Mascarenhas, M., Reis, C. (2010). Três anos de implementação de medidas de compensação de impactes sobre espécies ameaçadas: Qual o balanço? [Three years of implementation of compensation measures for impacts on endangered species: What is the balance?]. 12th edition of "Encontro Nacional de Ecologia". 18th to the 20th October 2010. Oporto, Portugal. [in Portuguese]
2010	Oral presentation | Biodiversity Information Systems	Palminha, G., Costa, H., Mascarenhas, M. (2010). Biodiversity Information Systems: Examples of Data Management. Nature-SDIplus Conference "SDI for Nature Conservation", IGP. 28-29 September 2010. Lisbon, Portugal.
2010	Oral presentation | Land management assessments	Mesquita S., Bernardino, J., Mascarenhas, M., Costa, H., Roxo, A. (2010). A Directiva Habitats e a Avaliação de Planos: uma proposta metodológica [Appropriate Assessment according to the Habitats Directive: a methodological proposal]. 1st edition of "Conferência da Rede de Língua Portuguesa de Avaliação de Impactos". Fundação Cidade de Lisboa. 16th to the 19th June 2010. Lisbon, Portugal. [in Portuguese]
2009	Oral presentation | Ecology	Paula, A. Cordeiro, A. Santos. J. Mouchinho, C. Costa, H. Reis, C. Mascarenhas, M. (2009). Preliminary results of the implementation of the Methodological Protocol of the Compensatory Measures resulting from the EIA Process of the Mogadouro - Valeira Line Extension for the SE of Olmos (Macedo de Cavaleiro) at 220 kV. Final Workshop – PEAR. 18 december 2009, Portugal.
2009	Oral presentation | Ecology	Paula, A., Cordeiro, A., Santos, J., Mascarenhas, M., Costa, H. (2009). Compensatory measures and the role they play in species conservation: Habitat Management and Monitoring of Ecosystems from the EIA Process of the project "Extension between the Mogadouro-Valeira line and the Olmos substation (Macedo de Cavaleiros), at 220 kV". 6th SPEA Ornithology Congress & 4th Iberian Congress of Ornithology. 5 to 8 december 2009. Elvas, Portugal.
2009	Poster | Ecology	Santos, J., Paula, A., Costa, H., Mascarenhas, M., Mouchinho, C., Fonseca, F., Reis, C. (2009). Evaluation of the success of habitat management measures in the recovery of red-legged partridge Alectoris rufa L. populations in the Rio Sabor valley. 6th SPEA Ornithology Congress & 4th Iberian Congress of Ornithology, 5 to 8 december 2009, Elvas, Portugal.
2009	Oral presentation | Wind Energy Monitoring	Mascarenhas, M., Paula, J., Santos, A., Lemos, A., Pacheco, F. (2009). The search and detection of bird and bat cadavers on wind farms. 8th International Seminar on Detection Dogs Registration – Canine Detection: 2012 and Beyond. 4-6 April 2009. London, UK.
2009	Oral presentation | Other	Palminha, G., Costa, H., Mascarenhas, M. (2009). Bio3 and Manifold GIS. European Manifold User Meeting

		2009, UCL. 15-17 February 2009. London, UK.
2009	Oral presentation | Mitigation measures	Paula, A. Cordeiro, A. Santos. J. Moucinho, C. Costa, H. Reis, C. Mascarenhas, M. (2009). Resultados preliminares da implementação do protocolo Metodológico das Medidas Compensatórias decorrentes do Processo de AIA do Ramal da Linha Mogadouro - Valeira para a SE de Olmos (Macedo de Cavaleiro), a 220 kV [Preliminary results of the implementation of the Mitigation Measures Protocol under the Environmental Impact Assessment for the Mogadouro - Valeira power line and Olmos substation (Macedo de Cavaleiros), at 220 kV]. Final Workshop - PEAR. 18th December 2009. Portugal. [in Portuguese]
2009	Oral presentation | Wind Energy & Power lines Impacts	Bernardino, J., Bispo, R., Torres, P., Rebelo, R., Mascarenhas, M., Costa, H. (2009). Qual o verdadeiro impacte dos parques eólicos e linhas eléctricas na avifauna? Avaliação das metodologias em uso e propostas para o seu aperfeiçoamento ["What's the real impact of wind farms and power lines on birds? Assessing the current methodologies and making proposals for its improvement"]. VI Congresso de Ornitologia da SPEA e IV Congresso de Ibérico de Ornitologia, SPEA e SEO. 5-8 December 2009. Elvas, Portugal. [in Portuguese]
2009	Oral presentation | Compensation measures	Paula, A., Cordeiro, A., Santos, J., Mascarenhas, M., Costa, H. (2009). Medidas compensatórias e o papel que desempenham na conservação de espécies: A Gestão de Habitat e Monitorização de Ecossistemas Decorrentes da DIA do Projecto Ramal entre a linha Mogadouro-Valeira e a Subestação de Olmos (Macedo de Cavaleiros), a 220 kV ["Off-site mitigation and the role it plays on species conservation: habitat management and ecosystem monitoring regarding the construction of a Power Line in the North-eastern Portugal"]. VI Congresso de Ornitologia da SPEA e IV Congresso de Ibérico de Ornitologia, SPEA e SEO. 5-8 December 2009. Elvas, Portugal. [in Portuguese]
2007	Oral presentation | Wind Energy Monitoring	Bernardino, J., Costa, H., Cardoso, P., Mascarenhas, M., Rebelo, R. (2007). Determining the mortality, scavenging removal and searcher efficiency rates in wind farms located in Aire and Candeeiros mountains, Portugal. II Meeting on Wind Energy and Nature Conservation 2007, Platform for the Rational Implementation of Wind Energy in Euskadi. 23-25 February 2007. Vitoria-Gasteiz, Spain.
2005	Proceedings | Baseline Ecological Studies	Costa, H., Mascarenhas, M., Cardoso, P.E. (2005). Que estratégia de intervenção em áreas ecologicamente sensíveis? Estudos Ecológicos de Base: uma ferramenta integrada [Which intervention strategy should be used in ecological sensitive areas? Baseline Ecological Studies: an integrated tool]. ENER'05 Conference on Renewable Energies and Environment in Portugal - the Portuguese situation in relation to the EU's goals. 5th to 7th May 2005. Figueira da Foz, Portugal. [in Portuguese]

Scott Masson
Visual Specialist

Profession	Senior Environmental Consultant
Education	MLA, L. Arch, Cape Town, 2008 BSc (Hons), Environmental Management, Cape Town, 2004 BSc, Environmental Management, Cape Town, 2003
Registrations/ Affiliations	Certified Environment Assessment Practitioner (South Africa)

Specialisation

Visual impact assessment (VIA), environmental impact assessment, environmental planning and site sensitivity studies

Expertise

Scott has been involved in the field of environmental and landscape architecture for the past 9 years. His expertise includes:

- Environmental impact assessments and environmental management plans;
- Visual impact assessments;
- Integrated waste and water management plans;
- Environmental audits and due diligence;
- Environmental control officer work;
- Environmental planning and sensitivity studies; and
- Landscape architectural planning and design.

Employment

2011 – present SRK Consulting (Pty) Ltd, Environmental Consultant, Cape Town

2009 – 2011 Megan Anderson Landscape Architects, Candidate Landscape Architect

Publications

I have been interviewed and quoted in numerous environmental and sustainability articles published in the press and sector specific journals including *Civil Engineering Contractor*. *Position IT, Cape Business News* and *To Build*.

Languages

English – read, write, speak (Excellent)

Afrikaans – read, write, speak (Fair)

Scott Masson
Visual Specialist

Visual Impact Assessment

- VIA for Molteno Wind Energy Facility near Queenstown, Eastern Cape, 2018, R139 000
- Anglo American Platinum, Visual Impact Statement for the Der Brochen Mine Expansion project, 2018, R30 000
- Lions Hill Development Company, VIA for the EA Amendment Application for the proposed Lions Hill Development, 2018, R70 000
- Lions Hill Development Company, Expert review of the VIA for the proposed Lions Hill Development (2017), 2018, R 9 000
- CSIR, Expert review of the Visual Resources Chapter of the Strategic Environmental Assessment for Electrical Grid Infrastructure in South Africa, 2018, R 5000
- CSIR, Expert review of the Visual Resources Chapter of the Strategic Environmental Assessment for Aquaculture in South Africa, 2017
- Eskom, VIA for the proposed 66/132 kV Romansrivier – Ceres powerline, 2017, R70 000
- CSIR, VIA for two wind energy facilities in the Greater Accra District, Ghana, 2016-2017, R100 000
- Mineral Sands Resources (Pty) Ltd, VIA for the extension of Tormin Mine, Western Cape, 2016-ongoing, R100 000
- Tronox Mineral Sands (Pty) Ltd, VIA for the Slimes Dam 6 at Tronox Namakwa Sands Mine, Western Cape, 2016, R30 000
- Department of Forestry, Fisheries and Agriculture, VIA for a proposed Aquaculture Development Zone in Saldanha Bay, Western Cape, 2016, R50 000
- Matzikama Municipality, VIA for the proposed construction of four abalone farms in Doringbaai, Western Cape, 2015 - 2016
- Eskom, VIA for the proposed Merino substation and Bon-Chretien-Merino powerline in Ceres, Western Cape, 2016-ongoing
- Transnet Capital Projects, VIA for the construction of additional substations, transmission infrastructures and area lighting masts near the Port of Saldanha, Western Cape, 2015-2017, R40 000
- EFG Engineers, VIA for the proposed bypass road in Hermanus, Western Cape, 2015-2016, R49 000
- Liesbeek Leisure Club (Pty) Ltd, VIA for the proposed redevelopment of the River Club, Western Cape, 2015-2017, R55 000
- Eskom, VIA for the proposed TISF at Koeberg, Western Cape, 2015-2016, R42 000
- Tronox Mineral Sands (Pty) Ltd, VIA for the proposed expansion of the Namakwa Sands Mine, Brand-se-Baai, Western Cape, 2012-2013, R46 000
- Vale, VIA for a proposed phosphate mine in Mozambique, 2011-2012, R100 000

- Courtrai Developments, VIA for a proposed retirement village in Paarl, 2011, R35 000
- CSIR Environmental, VIA for an EIA proposal for four wind energy facilities, Swellendam, Mossel Bay, Heidelberg and Albertinia, Western Cape, 2010, R100 000
- CSIR Environmental, VIA for a proposed eco-residential estate and nature reserve, Jacobsbaai, Western Cape, 2010, R25 000
- Vodacom, VIA for a proposed cell phone mast at Hermanus golf course, on Graymead farm near Villiersdorp and on a farm in Klipdale, 2009, R30 000

CURRICULUM VITAE

Name Hlengiwe Innocentia Ntuli

Profession PPP Support and Administrator

Name of Firm SiVEST SA (PTY) LTD

Present Appointment Projects Secretary / Support and PPP Administrator

Years with Firm 6 Years

Date of Birth 27 September 1989

ID Number 890927 02300 83

Nationality South African

Education

Minerva High School (2002 - 2006)
College Campus (2007-2009)

Professional Qualifications

Certificate in Contact Centre Support NQF2 (2010)
Diploma in IT Programming (2007 – 2009)

Employment Record

Jun 2012 – to date SiVEST SA (Pty) Ltd: Divisional Secretary / PPP Support and Administratore

May 2009 – May 2012 DSG (PTY) LTD: Contact Centre Agent

Language Proficiency

LANGUAGE	SPEAK	READ	WRITE
IsiZulu	Fluent	Fluent	Fluent
English	Fluent	Fluent	Fluent

Key Experience

Hlengiwe joined SiVEST in 2012 and holds the position of Projects Secretary in the Johannesburg Office of SiVEST and assists in the general day to day administration of the organisation.

She has taken on the role of public participation process administrator which includes maintaining project database, arranging and coordinating public meetings as well as following up with organs of states to get comments on projects.

Administrative Experience

Administrative responsibilities include:

- PPP Administration and use of Maximiser
- Filing electronically and paper copies
- Faxing, scanning, emailing, phoning, printing and typing
- Collecting of HR documents (timesheets, leave forms, expense, travel)
- Reception and switchboard reliever
- Document distribution

- Travel arrangements
- Purchasing and outsourcing

Project Experience

- Public Participation Process for the Proposed Construction of the Graskoppies On-site Eskom Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.
- Public Participation Process for the Proposed Construction of the Hartebeest Leegte On-site Eskom Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.
- Public Participation Process for the Proposed Construction of the Ithemba On-site Eskom Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.
- Public Participation Process for the Proposed Construction of the !Xha Boom On-site Eskom Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.
- Public Participation Process for the Proposed Refurbishment of the Swartberg Repeater Road near Ladysmith, Western Cape Province
- Basic Assessment (BA) for Proposed Refurbishment of the Swartberg Repeater Road near Ladysmith, Western Cape Province

CURRICULUM VITAE

Name	Kerry Lianne Schwartz
Profession	GIS Specialist
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Senior GIS Consultant: Environmental Division
Years with Firm	30 Years
Date of Birth	21 October 1960
ID No.	6010210231083
Nationality	South African

Professional Qualifications

BA (Geography), University of Leeds 1982

Membership to Professional Societies

South African Geomatics Council – GTc GISc 1187

Employment Record

1994 – Present	SiVEST SA (Pty) Ltd - Environmental Division: GIS/Database Specialist.
1988 - 1994	SiVEST (formerly Scott Wilson Kirkpatrick): Town Planning Technician.
1984 – 1988	Development and Services Board, Pietermaritzburg: Town Planning Technician.

Language Proficiency

LANGUAGE	SPEAK	READ	WRITE
English	Fluent	Fluent	Fluent

Key Experience

Kerry is a GIS specialist with more than 20 years' experience in the application of GIS technology in various environmental, regional planning and infrastructural projects undertaken by SiVEST.

Kerry's GIS skills have been extensively utilised in projects throughout South Africa in other Southern African Countries. These projects have involved a range of GIS work, including:

- Design, compilation and management of a demographic, socio-economic, land use, environmental and infrastructural databases.
- Collection, collation and integration of data from a variety of sources for use on specific projects.
- Manipulation and interpretation of both spatial and alphanumeric data to provide meaningful inputs for a variety of projects.
- Production of thematic maps and graphics.
- Spatial analysis and 3D modelling, including visual and landscape assessments.

Projects Experience

STRATEGIC PLANNING PROJECTS

Provision of database, analysis and GIS mapping support for the following:

- Water Plan 2025: Socio-economic, Land Use and Demographic Update – Umgeni Water (KwaZulu-Natal).
- Eskom Strategic Plan – Eskom (KwaZulu-Natal).
- Umgeni Water Quality Management Plan – Department of Water Affairs and Umgeni Water (KwaZulu-Natal).
- KwaZulu-Natal Development Perspective – Department of Economic Affairs (KwaZulu-Natal).
- Indlovu Regional Integrated Plan – Department of Local Government and Housing (KwaZulu-Natal).
- Umgeni Water and Sanitation Needs Analysis – Umgeni Water (KwaZulu-Natal).
- Metro Waste Water Management Plan – Durban Waste Water management, City of Durban (KwaZulu-Natal).
- KwaZulu-Natal Electrification Prioritisation Model – Eskom (KwaZulu-Natal).
- Umzinyathi Regional Development Plan – Umzinyathi Regional Council (KwaZulu-Natal).
- GIS driven model to assess future population growth in quaternary catchments under different growth scenarios – Umgeni Water (KwaZulu-Natal).
- Ubombo Master Water Plan Study – Mhlathuze Water Board (KwaZulu-Natal).
- Development strategy for local economic development and social reconstruction of the Germiston-Daveyton Activity Corridor – Eastern Gauteng Services Council (Gauteng).
- Structure Plan for the Cities of Beira and Dondo in Mozambique – World Bank.
- Land identification study for low cost housing in the Indlovu Region – Indlovu Regional Council (KwaZulu-Natal).
- Local Development Plan for Manzini – Manzini Town Council (Swaziland).
- Indlovu Project Prioritisation Model – Indlovu Regional Council (KwaZulu-Natal).
- Structure Plans for the Cities of Ndola and Luanshya - Ministry of Local Government and Housing (Zambia).
- Database development for socio-economic and health indicators arising from Social Impact Assessments conducted for the Lesotho Highlands Development Association – Lesotho.
- Development Plan for the adjacent towns of Kasane and Kazungula - Ministry of Local Government, Land and Housing (Botswana).
- Development Plan for the rural village of Hukuntsi - Ministry of Local Government, Land and Housing (Botswana).
- Provision of data platform for the spatial analysis of water supply, demand and affordability in Bulawayo – City of Bulawayo and NORAID (Zimbabwe).
- Integrated Development Plans for various District and Local Municipalities including:
    - Nquthu Local Municipality (KwaZulu-Natal)
    - Newcastle Local Municipality (KwaZulu-Natal)
    - Amajuba District Municipality (KwaZulu-Natal)
    - Jozini Local Municipality (KwaZulu-Natal)
    - Umhlabuyalingana Local Municipality (KwaZulu-Natal)
- uMhlathuze Rural Development Initiative – uMhlathuze Local Municipality (KwaZulu-Natal).
- Rural roads identification – uMhlathuze Local Municipality (KwaZulu-Natal).
- Mapungubwe Tourism Initiative – Development Bank (Limpopo Province).
- Northern Cape Tourism Master Plan – Department of Economic Affairs and Tourism (Northern Cape Province).

- Spatial Development Framework for Gert Sibande District Municipality (Mpumalanga) in conjunction with more detailed spatial development frameworks for the 7 Local Municipalities in the District, namely:
  - Albert Luthuli Local Municipality
  - Msukaligwa Local Municipality
  - Mkhondo Local Municpality
  - Pixley Ka Seme Local Municipality
  - Dipaleseng Local Municipality
  - Govan Mbeki Local Municipality
  - Lekwa Local Municipality
- Land Use Management Plans/Systems (LUMS) for various Local Municipalities including:
  - Nkandla Local Municipality (KwaZulu-Natal)
  - Hlabisa Local Municipality (KwaZulu-Natal)
  - uPhongolo Local Municipality (KwaZulu-Natal)
  - uMshwathi Local Municipality
- Spatial Development Framework for uMhlathuze Local Municipality (KwaZulu-Natal).
- Spatial Development Framework for Greater Clarens – Maloti-Drakensberg Transfrontier Park (Free State).
- Land use study for the Johannesburg Inner City Summit and Charter – City of Johannesburg (Gauteng).
- Port of Richards Bay Due Diligence Investigation – Transnet
- Jozini Sustainable Development Plan – Jozini Local Municipality (KwaZulu-Natal)
- Spatial Development Framework for Umhlabuyalingana Local Municipality (KwaZulu-Natal)

BUILT INFRASTRUCTURE

- EIA and EMP for a 9km railway line and water pipeline for manganese mine – Kalagadi Manganese (Northern Cape Province).
- EIA and EMP for 5x 440kV Transmission Lines between Thyspunt (proposed nuclear power station site) and several substations in the Port Elizabeth area – Eskom (Eastern Cape Province).
- Initial Scoping for the proposed 750km multi petroleum products pipeline from Durban to Gauteng/Mpumalanga – Transnet Pipelines.
- Detailed EIA for multi petroleum products pipeline from Kendall Waltloo, and from Jameson Park to Langlaagte Tanks farms –Transnet Pipelines.
- Environmental Management Plan for copper and cobalt mine (Democratic Republic of Congo).
- EIA and Agricultural Feasibility study for Miwani Sugar Mill (Kenya).
- EIAs for Concentrated Solar and Photovoltaic power plants and associated infrastructure (Northern Cape, Free State, Limpopo and North West Province).
- EIAs for Wind Farms and associated infrastructure (Northern Cape and Western Cape).
- Basic Assessments for 132kV Distribution Lines (Free State, KwaZulu-Natal, Mpumalanga and North West Province).
- Environmental Assessment for the proposed Moloto Development Corridor (Limpopo).
- Environmental Advisory Services for the Gauteng Rapid Rail Extensions Feasibility Project.
- Environmental Screening for the Strategic Logistics and Industrial Corridor Plan for Strategic Infrastructure Project 2, Durban-Free State-Gauteng Development Region.

STATE OF THE ENVIRONMENT REPORTING

- 2008 State of the Environment Report for City of Johannesburg.

- Biodiversity Assessment – City of Johannesburg.

STRATEGIC ENVIRONMENTAL ASSESSMENTS AND ENVIRONMENTAL MANAGEMENT FRAMEWORKS

- SEA for Greater Clarens – Maloti-Drakensberg Transfrontier Park (Free State).
- SEA for the Marula Region of the Kruger National Park, SANParks.
- SEA for Thanda Private Game Reserve (KwaZulu-Natal).
- SEA for KwaDukuza Local Municipality (KwaZulu-Natal).
- EMF for proposed Renishaw Estate (KwaZulu-Natal).
- EMF for Mogale City Local Municipality, Mogale City Local Municipality (Gauteng).
- SEA for Molemole Local Municipality, Capricorn District Municipality (Limpopo).
- SEA for Blouberg Local Municipality, Capricorn District Municipality (Limpopo).

WETLAND STUDIES

- Rehabilitation Planning for the Upper Klip River and Klipspruit Catchments, City of Johannesburg (Gauteng).
- Wetland assessments for various Concentrated Solar and Photovoltaic power plants and associated infrastructure (Limpopo, Northern Cape, North West Province and Western Cape).
- Wetland assessments for Wind Farms and associated infrastructure (Northern Cape and Western Cape).
- Wetland assessments for various 132kV Distribution Lines (Free State, KwaZulu-Natal, Mpumalanga and North West Province).

VISUAL IMPACT ASSESSMENTS

- VIA for the redevelopment of the Newmarket Racecourse in Alberton (Gauteng).
- VIA for the Thyspunt Transmission Lines Integration Project (Eatern Cape).
- VIA s for various Solar Power Plants (Northern Cape, Free State, Limpopo and North West Province).
- VIAs for various Wind Farms (Northern Cape and Western Cape).
- VIAs for various 132kV Distribution Lines (Free State, KwaZulu-Natal, Mpumalanga and North West Province).
- VIA for the proposed Rorqual Estate Development near Park Rynie on the South-Coast of KwaZulu-Natal Province.
- VIA for the proposed Assagay Valley Mixed Use Development (KwaZulu-Natal).
- VIA for the proposed Kassier Road North Mixed Use Development (KwaZulu-Natal).
- VIA for the proposed Tinley Manor South Banks Development (KwaZulu-Natal).
- VIA for the proposed Tinley Manor South Banks Beach Enhancement Solution, (KwaZulu-Natal).
- VIAs for the proposed Mlonzi Hotel and Golf Estate Development (Eastern Cape Province).
- VIA for the Eastside Junction Mixed-use development near Delmas (Mpumalanga).
- Visual sensitivity mapping exercise for the proposed Mogale's Gate Lodge Expansion (Gauteng).
- Analysis phase visual assessment for the proposed Renishaw Estate Environmental Management Framework in the Scottburgh Area (KwaZulu-Natal).
- Landscape Character Assessment for Mogale City Environmental Management Framework (Gauteng).

CURRICULUM VITAE

Name	Liandra Scott-Shaw (neé Bertolli)
Profession	Environmental Scientist
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Environmental Consultant
Years with Firm	4.5 Years
Date of Birth	08 March 1986
Nationality	South African
ID No.	8603080022083

Education

Matric Exemption (Natal Education Department) Durban Girls High School (2002-2003)

Professional Qualifications

Bachelor of Science (Biological Science): University of KwaZulu-Natal, 2008
Bachelor of Science (Honours) Ecological Science: University of KwaZulu-Natal, 2009

Membership to Professional Societies

South African Council for Natural Scientific Professions (SACNASP) Pr.Sci.Nat. No. 117442
Royal Society of South Africa 2010-Present
International Association for Impact Assessment South Africa (IAIAsa)

Years of Experience

5.5 Years

Employment Record

Jan 2014 - current	SiVEST SA (PTY) LTD – Environmental Division: Environmental Consultant
Jun 2013 - Dec 2013	ECO-PULSE Environmental Consulting Services - Internship
Jan 2010 - Jan 2013	University of the North West (Diatom collection, process and analysis)
Jan 2012 - Dec 2012	John Bews Herbarium, (Geo referencing specimen)
Feb 2006 - Jun 2013	University of KwaZulu-Natal (Laboratory and field assistant for the School of Biological and Conservation Science, Demonstrating and Lecturing in Biology and Biogeography)

Language Proficiency

LANGUAGE	SPEAK	READ	WRITE
English	Fluent	Fluent	Fluent
Afrikaans	Basic	Basic	Basic

Key Experience

Liandra joined SiVEST in January 2014 in her capacity as an Environmental Consultant.

Liandra has completed a Bachelor of Science Degree in Biological Science (University of KwaZulu-Natal, PMB), a Bachelor of Science (Honours) in Ecological Science (University of KwaZulu-Natal, PMB) and is completing her Master of Science Degree in Environmental Science (University of KwaZulu-Natal, PMB), of which the focus is on Diatoms as indicators of wetland water quality in the KZN Midlands.

Liandra has been involved in consulting since 2013, which included biodiversity assessments and analyses as well as report writing. Prior to that, Liandra had been involved in academic research and demonstrating/lecturing since 2008.

Liandra's expertise and knowledge areas involve:

- Plant biodiversity assessments
- Alien plant identification/management
- Diatom diversity assessments
- Field identification
- Taxonomical background
- Report writing (EIA/BA/Specialist studies)
- NEMA and NEM:BA regulations and policies

Projects Experience

VEGETATION ASSESSMENTS, REHABILITATION PLANS AND PERMIT APPLICATIONS

- Eshowe SSA1 Pipeline Project
- Bishopstowe Development Area
- Dube TradePort State of Environment Report
- Transnet Richards Bay Port Development Vegetation Assessment
- Transnet South Dune Vegetation Assessment
- Umsunduzi Greater Edendale Environmental Management Framework
- Sumitomo Rubber Manufacturing Plant Vegetation Assessments, Alien Plant Management Plan and Plant Permits
- Umgeni Water Darvill Constructed Wetland Vegetation Assessment
- P75-2 Road Upgrade Vegetation Assessment
- Masinege Sewer Line Vegetation Permits
- Tongaat Hulett Cornubia North Development Vegetation Assessment
- Tongaat Hulett Lindokuhle Housing Development Vegetation Assessment
- Tongaat Hulett Simhlangentsha Pipeline Vegetation Assessment
- Tongaat Hulett Dudley Pringle Development Vegetation Assessment
- Tongaat Hulett Maidstone Mill Development Vegetation Assessment
- Arcelor Mittal Newcastle Works Alien Plant Management Plan
- Umgeni Water Umshwathi Pipeline Vegetation Assessment
- ACSA GCS Diatom Sampling
- Mandeni Cemetery Vegetation Assessment
- Fountain Hill Development Vegetation Assessment
- Salt Rock Development Vegetation Assessment
- Colenso Coal Project
- Strode Property Development Vegetation Assessment

- Tongaat Hulett Tinley Manor South Wetland Assessment (vegetation)
- Tongaat Hulett Tinley Manor North Wetland Assessment (vegetation)
- Umgeni Water South Coast Pipeline Vegetation Assessment, Plant Permits
- Swayimane Bulk Water Pipeline
- Westbrook Club Development Vegetation Assessment
- Eskom Candover – Mbazwana Vegetation Assessment and Plant Permits
- Eskom Eshowe Electrification Vegetation Assessment and Plant permits
- Eskom Empangeni Electrification Vegetation Assessment and Plant permits
- Eskom Jozini Electrification Vegetation Assessment and Plant permits
- Eskom Electrification Vegetation Assessment and Plant permits
- Eskom Nsele Godi Electrification Vegetation Assessment and Plant permits
- Eskom Makhatini Electrification Vegetation Assessment and Plant permits
- Eskom Esicabazeni Electrification Vegetation Assessment and Plant permits
- Ethekwini Hammarsdale Electrification Vegetation Assessment
- Shemula Pipeline Vegetation Assessment and Plant permits
- Ezakheni Housing Vegetation Assessment
- Ashton College Vegetation Assessment
- eThekwini Metropolitan Marianridge Housing Development Vegetation Assessment
- Edendale Town Centre Development Vegetation Assessment
- N2 Pongola Ecological Studies Vegetation Assessment
- Sani Pass Hotel Upgrades Vegetation Assessment
- Eskom Lake Eland Vegetation Assessment and Plant permits
- Eskom Phungashe Phase 3 Vegetation Assessment and Plant permits
- Eskom Bhanbanani Vegetation Assessment and Plant permits
- Eskom Sunduza Vegetation Assessment and Plant permits
- Eskom TC Xumalo Vegetation Assessment and Plant permits
- Eskom Cwakeme Vegetation Assessment and Plant permits
- Eskom Mambane Vegetation Assessment and Plant permits
- Eskom Nkangala Vegetation Assessment and Plant permits
- Eskom Estcourt Permits Vegetation Assessment and Plant permits
- Eskom Emahusheni Permits Vegetation Assessment and Plant permits
- Eskom Mamfene Permits Vegetation Assessment and Plant permits
- Eskom Qwabe Permits Vegetation Assessment and Plant permits
- Eskom BA Khumalo Permits Vegetation Assessment and Plant permits
- Eskom Zululand Melmoth Vegetation Assessment and Plant permits
- Eskom Muller Helgardt Permits Vegetation Assessment and Plant permits
- Eskom Zamazama Permits Vegetation Assessment and Plant permits
- Wild Tomorrow Fund South Bank Permits Vegetation Assessment and Plant permits

ENVIROMENTAL CONTROL OFFICER

- Eskom Candover-Mbazwana Powerline
- Lombardskop Pipeline
- Zimbali Lakes Golf Course
- Fitty Park Water Pipeline
- Driefontein Phase 1 Water Pipeline
- Middledrift SSA5 Water Pipeline
- Lower Tugela Bulk Water Off-take 12
- Lower Tugela Bulk Water Off-take 10
- Lower Tugela Bulk Water Off-take 1
- Lower Tugela Bulk Water Off-take 11
- Mpumulanga Unit G Development
- Maphumulo (Invutshane Dam) Phase 2 Pipeline

BASIC ASSESSMENTS / ENVIRONMENTAL IMPACT ASSESSMENTS

- La Mercy Integrated Human Settlement Development BA
- Greater Kokstad Bulk Raw Water Upgrade Project
- Dube TradePort Agrizone 2
- D1562 Road Upgrade BA
- Mthandeni Irrigation Extension Project
- Shemula Bulk Raw Water Phases 2 - 6 BA
- Izinga Phase 3 BA
- Zimbali Estate Properties BA
- Cornubia Portion 14 Petrol Filling Station
- South Coast Pipeline BA
- Swayimane Bulk Water BA
- Mshwathi Pipeline BA
- Mshwathi Pipeline BA Amendments
- Compensation Organic Waste Facility
- Sumitomo Rubber Manufacturing Plant BA
- Darvill Constructed Wetland
- Dube Tradeport Agrizone 2
- Eshowe SSA Water Pipeline BA
- Marianridge Erf 6900 Housing Development BA
- Kokstad Housing Development BA
- Kindlewood/Mount Edgecombe Estate BA
- Edendale Town Centre Development BA
- La Mercy Beach Node Development BA
- Ladysmith Shopping Mall Development
- Cornubia Petrol Filling Station
- Compensation Organic Waste Development
- Waterval Prison Upgrades BA
- Eshowe SSA1 Pipeline Project
- Ashton College 24G

ENVIRONMENTAL MANAGEMENT FRAMEWORK AND MAINTENANCE MANAGEMENT PLAN

- Greater Edendale Area
- Phinda Private Game Reserve Maintenance Management Plan

Academic contributions

Lang P, Taylor J, Bertolli L, Lowe S, Dallas H, Kennedy MP, Gibbins C, Sichingabula H, Saili, Day J, Willems F, Briggs JA and Murphy KJ 2013. Proposed procedure for the sampling, preparation and analysis of benthic diatoms from Zambian rivers: a bioassessment and decision support tool applicable to freshwater ecoregions in tropical southern Africa. Africa, Caribbean, Pacific- European Union Project Report.

Martins S, Kennedy M, Lowe S, Lang P, Briggs J, Dallas H, Taylor J, Bertolli L, Gibbins C, Soulsby C, Day J, Sichingabula H, Saili H, Kapungwe E, Willems F, Mbulwe F, Murphy K. 2013. SAFRASS Methodology Manual.

Shrader AM, Bell C, Bertolli L and Ward D 2012. Forest or the trees: at what scale do elephants make foraging decisions? Acta Oecologica 42: 3-10.

Lang P, Taylor J, Bertolli L, 2012. River diatom biodiversity assessments in Zambian rivers: a SAFRASS conservation perspective. European Congress of Conservation Biology, Glasgow.

Martins S, Kennedy M, Lowe S, Lang P, Briggs J, Dallas H, Taylor J, Bertolli L, Gibbins C, Soulsby C, Day J, Sichingabula H, Saili H, Kapungwe E, Willems F, Mbulwe F, Murphy K. 2012. SAFRASS Photographic guide to the Aquatic Macroinvertebrates of Zambia. European Union Project Report.

Martins S, Kennedy M, Lowe S, Lang P, Briggs J, Dallas H, Taylor J, Bertolli L, Gibbins C, Soulsby C, Day J, Sichingabula H, Saili H, Kapungwe E, Willems F, Mbulwe F, Murphy K. 2012. SAFRASS Guide to Common Diatoms. European Union Project Report.

Martins S, Kennedy M, Lowe S, Lang P, Briggs J, Dallas H, Taylor J, Bertolli L, Gibbins C, Soulsby C, Day J, Sichingabula H, Saili H, Kapungwe E, Willems F, Mbulwe F, Murphy K. 2012. SAFRASS Macrophyte Identification Manual.

Conferences and workshops

SAFRASS Diatom Genera Guide Workshop 2013

Programa de Avaliação de Rios no Sul de África (SAFRASS): estabelecimento de uma estrutura de investigação na construção de capacidade para promoção da saúde e biodiversidade dos rios africanos.

Martins S, Kennedy M, Lowe S, Lang P, Briggs J, Dallas H, Taylor J, Bertolli L, Gibbins C, Soulsby C, Day J, Sichingabula H, Saili H, Kapungwe E, Willems F, Mbulwe F, Murphy K. *14th Congr. Bras. Limnol., Bonito, Brasil,* Sept. 2013

SAFRASS biomonitoring scheme: general aspects, macrophytes (ZMTR) and benthic macroinvertebrates (ZISS) protocols 2013

SAFRASS Training Introduction May 2012: Helen Dallas

SAFRASS Decision Support Scheme (DSS) to assist the use of river health biomonitoring protocols in Zambia: general aspects, invertebrates (ZISS) and macrophytes (ZMTR) components 2012

SAFRASS Training Macrophytes May 2012 Mike Kennedy 2012

SAFRASS Training Invertebrates May 2012 Steven Lowe

SAFRASS Training Diatoms May 2012 Jonathan Taylor

Shrader AM, Bell C, **Bertolli L** and Ward D 2011. Forest or the trees: at what scale do elephants make foraging decisions? *Ezemvelo KZN Wildlife Contemporary Conservation Symposium*.

SAFRASS Proposed procedure for the sampling, preparation and analysis of benthic diatoms from Zambian rivers: a bioassessment and decision support tool applicable to freshwater ecoregions in tropical southern 2011

SAFRASS Assessment of performance of the SAFRASS pilot river biomonitoring scheme 2011

ILAN SMEYATSKY

Professional Archaeologist

Personal Details

Name: Ilan

Surname: Smeyatsky

Identity Number: 9109275072080

Date of Birth: 27-09-1991

Citizenship: South African

Gender: Male

Marital Status: Single

Languages Spoken: English

Education History

2010-2013: BSc Bachelors Degree

University of the Witwatersrand, Johannesburg, South Africa

Archaeology

Psychology

Statistics

Research Design and Analysis

67% Pass (2:1 Qualification)

2014: BSc (Hons) in Archaeology

AWARDS:

Received the 2014 Center of Excellence in Palaeoscience award - Bursary to the value of ZAR 30000 ≈ $2500

Received the Post-Graduate Merit Award in 2015 for academic merit for my Honours academic results - Bursary to the value of ZAR 25000 ≈ $1800

University of the Witwatersrand, Johannesburg, South Africa

Archaeology

Excavation techniques

Theory

69% Pass (2:1 Qualification)

Distinction received for thesis entitled: “Stylistic variation in Later Stone Age tanged arrowheads: a pilot study using geometric morphometrics”

2015-2017: MSc by Research (Archaeology)

University of the Witwatersrand, Johannesburg, South Africa
Archaeology
Statistical analysis
GIS (Geographic Information Systems)
Thesis entitled: “Discerning and explaining shape variations in Later Stone Age tanged arrowheads, South Africa”

Aug 2016 –
Jan 2017: Semester of Archaeology Masters

AWARD: Received the 2016 AESOP+ full Masters scholarship to study at Uppsala University, Uppsala, Sweden – **Scholarship to the value of ZAR 160,000 ≈ $11,000**
Uppsala University, Uppsala, Sweden
Archaeological theory
GIS (Geographic Information Systems)
Invitational research

Employment History
Part time employment as a student:

2009-2013: Part-Time Electrician Apprentice: Assisting in home electrical repair jobs.
2014-2015: Lab Research Assistant: Analysing and classifying lithic artefacts, Data capturing, Mentoring trainee research assistants.

Experience in the field of archaeology:

2013-2015: Fieldwork/Excavator - Responsibilities: Feature detection, excavation, sieving, sorting, analysis, soil sampling, field documentation, ‘dumpy’ operation , Total Station operation, DGPS operation, rock art tracing and photography, engraving tracing and photography.
South African excavations:

Early Stone Age excavation at Maropeng World Heritage Site in Gauteng (1 Week – August 2015)

Pig cadaver exhumation as part of forensic experiment near Pretoria, Gauteng (1 Week – December 2014) - Praised for having the determination of returning for each subsequent excavation day as it was performed on a purely volunteer basis and the work conditions were particularly strenuous - Dr. Coen Nienaber

Iron Age excavation at Komati Gorge, Mpumalanga (1 Week – August 2014) - Praised for being exceptionally "methodical and proficient" with my excavation techniques – Dr. Alex Schoeman

Rock art fieldwork at Komati Gorge, Mpumalanga (1 Week – August 2014)

Underwater archaeology site mapping Komati Gorge, Mpumalanga (1 Week – August 2014)

Early Stone Age excavation at Maropeng World Heritage Site in Gauteng (2 Weeks - September 2013) - Personally uncovered some of the only stone tools (~1.8 million years old) found during that digging season.

2016: Excavation Supervisor - Responsibilities: Supervision of two junior excavators, site detection, decision of excavation grid placement, excavation, sieving, sorting, soil sampling, field documentation.

Historical (farm site) excavation at Graaff-Reinet, Eastern Cape, South Africa (2 Weeks)

Completed dig 1 week ahead of schedule aided by my efficient direction, drive and support to the excavators under my supervision.

April 2017 – April 2018: Intern Archaeologist – PGS Heritage: Heritage Impact assessments, background research, report writing, permit applications, collections management, stakeholder engagement and grave relocation.

April 2018 – PRESENT: Archaeologist – PGS Heritage: Heritage Impact assessments, background research, report writing, permit applications, collections management, stakeholder engagement and grave relocation.

Professional Body Membership:

Professional Archaeologist - Association of Southern African Professional Archaeologists (ASAPA) - Professional Member

CRM Accreditation (ASAPA) -

Field Supervisor – Stone Age, Iron Age & Grave Relocations

1. Proposed Position : Noise & Glare Impact Specialist
2. Name of Firm : Safetech
3. Name of Staff : Brett Williams
4. Date of Birth : 21/04/1963

   Nationality : South African

   Total Years of Experience : 31

   Identity Number : 630421 5081 084

5. Education:

Qualification	Institution	Date Obtained
• Bachelor of Arts	University of Port Elizabeth	1991
• National Diploma Health & Safety Management	University of South Africa	1999
• Master of Business Administration (University of Wales) with dissertation on environmental reporting in South Africa.	University of Wales	2000
• PhD – Environmental Management	University of Pretoria	2014

6. Membership of Professional Associations

Membership	Professional Associations
Occupational Hygienist	Southern African Institute of Occupational Hygienists
Member	Institute of Safety Management
Member	Mine Ventilation Society
Member	National Clean Air Association

7. Other Training
   - US EPA Air Dispersion Modelling Training Course
   - Various Health & Safety Courses.
   - Environmental Auditor (ISO 14001:2004)
   - Harvard University – Applications of Industrial Hygiene Principles – including noise
   - United States EPA Pollution Measurement course conducted at the University of Cincinnati (EPA Training Centre)

8. Work Experience Relating to Noise Impact Assessments

   - Arcus Gibb – Kouga Wind Energy Project

   - CSIR – Umgeni Water Lovu Desalination Plant
   - CSIR – Umgeni Water Tongaat Desalination Plant
   - CSIR – Saldanha Desalination Plant
   - CSIR – Atlantis Gas to Power Project (current)
   - CSIR – Walvis Bay Port Extension
   - CSIR – Noise Impact Study of Namwater Desalination Plant
   - CSIR – Kouga Wind Energy Project – Background Noise Measurements
   - CSIR – Kouga Wind Energy Project
   - CSIR – Wind Current Wind Energy Project
   - CSIR – Langefontein Wind Energy Project
   - CSIR – Mossel Bay Wind Energy Project
   - CSIR – Coega IDZ Wind Energy Project
   - CSIR – Baakenskop Wind Energy Project
   - CSIR – Biotherm Wind Energy Project
   - CSIR – Innowind Mossel Bay
   - CSIR – Langefontein Wind Energy Project

- CSIR – Bulk Manganese Terminal (Port of Ngqura)
- CSIR – Phyto Amandla Biodiesel Project
- CSIR – Vleesbaai Wind Energy Project
- CSIR - Kudusberg Wind Energy Project
- CES – Coega IDZ Gas to Power Project (Current)
- CES – Coega IDZ Wind Energy Project
- CES – Middleton Wind Energy Project
- CES – Waainek Wind Energy Project
- CES – Ncora Wind Energy Project
- CES – Qunu Wind Energy Project
- CES – Nqamakwe Wind Energy Project
- CES – Plan 8 Wind Energy Project
- CES – Qumbu Wind Energy Project
- CES – Peddie Wind Energy Project
- CES – Cookhouse Wind Energy Project
- CES – Madagascar Heavy Minerals
- CES – Richards Bay Wind Energy Project
- CES – Hluhluwe Wind Energy Project
- CES – Coega Innowind Wind Energy Project
- CES – Ngqura Power Barge
- CES – Dassies Ridge Wind Energy Project
- CES – Chaba 2 Wind Energy Project
- CES – Great Kei Wind Energy Project
- CES – Zirco Heavy Minerals Mine
- CEN – Kwandwe Airport Development Project
- CEN – Swartkops Manganese Project
- CEN – N2 Petro Port Project
- SiVest - Rondekop Wind Energy Project
- SiVest – Tooverkop Wind Energy Project
- SRK – Roodeplaat Wind Energy Project
- Savannah - Witberg Wind Energy Project
- Savannah - Kareebosch Wind Energy Project
- Crown Chickens – The independent report review of a noise specialist report conducted as part of an EIA to establish a new broiler farm
- BMW – The evaluation of the impact of the Rosslyn production facilities on the surrounding community Victory Race Track - Specialist noise report conducted as part of an EIA to establish a new stock car racing track.
- Continental Tyre - The evaluation of the impact of production facilities on the surrounding community.
- Media 24 – The measurement portion of an investigation on the impact of a printing press on a local community. The main study was conducted by the University of Stellenbosch.
- Zwartebosh Quarry - Specialist noise report conducted as part of an EIA to establish a new quarry.
- Milo Granite - Specialist noise report conducted as part of an EIA to establish a new quarry.
- Dunlop Tyres - The evaluation of the impact of production facilities on the surrounding community.
- Sasol Secunda - Independent report review of a noise specialist report conducted to determine the impact of production facilities on the surrounding community.
- Barlow World Coatings - The evaluation of the impact of production facilities on the surrounding community.
- Western Platinum Refinery - The evaluation of the impact of production facilities on the surrounding community.
- EnviroD – Phosphate Plant – Walvis Bay

9. Languages

Language	Speaking	Reading	Writing
English	Excellent	Excellent	Excellent
Afrikaans	Excellent	Excellent	Excellent

10. Employment Record:

From	To	Employer	Projects
1987	1992	NOSA	Various projects where HSE was audited
1992	present	Safetech	Projects as above

11. Detailed Tasks Assigned

Conduct Noise Impact Assessment	Occupational Health & Safety Consulting
Conduct air pollution surveys	
General Occupational Hygiene Assessments	

12. Work undertaken that Best Illustrates Capability to Handle the Tasks Assigned

See projects above.	

CERTIFICATION

I, the undersigned, certify that to the best of my knowledge and belief, these data correctly describe my qualifications, my experience, and me.

Dr. Brett Williams

IRIS SIGRID WINK

Profession	*Civil Engineer (Traffic & Transportation)*
Position in Firm	*Associate*
Area of Specialisation	*Manager: Traffic & Transportation Engineering*
Qualifications	*PrEng, MSc Eng (Civil & Transportation)*
Years of Experience	*16 Years*
Years with Firm	*6 Years*

SUMMARY OF EXPERIENCE

Iris is a Professional Engineer registered with ECSA (20110156). She joined JG Afrika (Pty) Ltd. in 2012. Iris obtained a Master of Science degree in Civil Engineering in Germany and has more than 16 years of experience in a wide field of traffic and transport engineering projects. Iris left Germany in 2003 and has worked as a traffic and transport engineer in South Africa and Germany. She has technical and professional skills in traffic impact studies, public transport planning, non- motorised transport planning and design, design and development of transport systems, project planning and implementation for residential, commercial and industrial projects and providing conceptual designs for the abovementioned. She has also been involved with transport assessments for renewable energy projects and traffic safety audits.

Iris is registered with the International Road Federation as a Global Road Safety Audit Team Leader.

PROFESSIONAL REGISTRATIONS & INSTITUTE MEMBERSHIPS

PrEng	-	Registered with the Engineering Council of South Africa No. 20110156 Registered Mentor with ECSA for the Cape Town Office of JG Afrika
MSAICE	-	Member of the South African Institution of Civil Engineers
ITSSA	-	Member of ITS SA (Intelligent Transport Systems South Africa)
SAWEA	-	Member of the South African Wind Energy Association
SARF	-	South African Road Federation: Committee Member of Council
SARF WR	-	South African Road Federation Western Region Committee Member
SARF WR	-	Managing the Road Safety Committee
IRF	-	Registered as International Road Safety Audit Team Leader

EDUCATION

1996 - Matric – Matric (Abitur) – Carl Friedrich Gauss Schule, Hemmingen, Germany
1998 - Diploma as Draughtsperson – Lower Saxonian State Office for Road and Bridge Engineering
2003 - MSc Eng (Civil and Transportation) – Leibniz Technical University of Hanover, Germany

SPECIFIC EXPERIENCE

JG Afrika (Pty) Ltd (Previously Jeffares & Green (Pty) Ltd)

2016 – Date
Position – Associate

Traffic Risk Assessment for Legoko Solarfarms, Client: Atlantic Renewable Energy Partners (Pty) Ltd

Road Safety Audits for N2 Wildcoast Toll Roads, Eastern Cape/Natal, Client: Aurecon/Knight Piesold on behalf of SANRAL

Traffic Risk Studies for the Kuruman Windfarm (450MW) in the Northern Cape, Client: CSIR on behalf of Mulilo

Beau Constantia and Constantia Glen Winefarms – Detailed Access Design, Client: private

Road Safety Audit for N1 Section 16 Winburg to Ventersburg – Client: Aurecon on behalf of SANRAL

Road Safety Audit for N2 Section 20 Wild Coast Toll Road Project – Client: Knight Piesold & Aurecon on behalf of SANRAL

Road Safety Audit Appraisals on roads in the Mpumalanga Province for the Department of Transport Mpumalanga - Client: AFRISA on behalf of DoT Mpumalanga

Traffic and Parking Audits for the Suburb of Groenvallei in Cape Town – Client: City of Cape Town Department of Property Management.

Road Safety Audit for the Upgrade of N1 Section 4 Monument River – Client: Aurecon on behalf of SANRAL

Road Safety Audit for the Upgrade of N2 Section 8 Knysna to Wittedrift – Client: SMEC on behalf of SANRAL

Road Safety Audit for the Upgrade of N1 Section 16 Zandkraal to Winburg South – Client: SMEC on behalf of SANRAL

Traffic and Road Safety Studies for the Improvement of N7 Section 2 and Section 3 (Rooidraai and Piekenierskloof pass) – Client: SANRAL

Road Safety Appraisals for Northern Region of Cape Town – Client: Aurecon on behalf of City of Cape Town (TCT)

Traffic Engineering Services for the Enkanini Informal Settlement, Kayamandi - Client: Stellenbosch Municipality

Lead Traffic Engineer for the Upgrade of a 150km Section of the National Route N2 from Kangela to Pongola in KwaZulu-Natal, Client: SANRAL

Traffic Engineering Services for the Kosovo Informal Settlement (which is part of the Southern Corridor Upgrade Programme), Client: Western Cape Government

Traffic and Road Safety Studies for the proposed Kosovo Informal Housing Development (part of the Southern Corridor Upgrade Program), Client: Western Cape Government.

Road Safety Audit Stage 3 – Upgrade of the R573 Section 2 between Mpumalanga/Gauteng and Mpumalanga/Limpopo, Client: AECOM on behalf of SANRAL

Road Safety Audit Stage 1 and 3 – Upgrade of the N2 Section 5 between Lizmore and Heidelberg, Client: Aurecon on behalf of SANRAL

Traffic Safety Studies for Roads Upgrades in Cofimvaba, Eastern Cape – Client: Cofimvaba Municipality

Road Safety Audit Stage 1 and 3 – Improvement of Intersections between Olifantshoek and Kathu, Northern Cape, Client: Nadeson/Gibb on behalf of SANRAL

Road Safety Audit Stage 3 – Upgrade of the Beacon Way Intersection on the N2 at Plettenberg Bay, Client: AECOM on behalf of SANRAL

Traffic Impact Assessment for a proposed Primary School at Die Bos in Strand, Somerset West, Client: Edifice Consulting Engineers

Road Safety Audit Stage 1 and 3 – Improvement of R75 between Port Elizabeth and Uitenhage, Eastern Cape, Client: SMEC on behalf of SANRAL

Road Safety Audit Stage 1 and 3 – Upgrade of the N2 between Heidelberg and Riversdale, Western Cape, Client: Aurecon on behalf of SANRAL

Traffic Impact Assessment and Site Safety Studies for the Extension of the Farewell King Site in the Durban Container Terminal, Client: Vopak

Road Safety Audit Stage 1 and 3 – Pedestrian Facilities at De Doorns on National Route 1 Section 3, Client: Aurecon on behalf of SANRAL

Road Safety Audit Stage 1 - Upgrade of the R63 Section 13 between Fort Beaufort and Alice, Client V3 Consulting on behalf of SANRAL

Traffic and Pedestrian Safety Studies for the Upgrade of the R63 Section 13 between Fort Beaufort and Alice, Client: V3 Consulting on behalf of SANRAL

Traffic Impact Assessment for the Crawford Campus of the College of Cape Town, Client: College of Cape Town

JG Afrika (Pty) Ltd (Previously Jeffares & Green (Pty) Ltd)

2012 – 2016
Position – Senior Traffic & Transportation Engineer

Traffic Impact Study for the Campsdrift Msunduzi Waterfront Housing Development, Pietermaritzburg, Client: Private

N2 Section 19 – **Traffic and Pedestrian Safety Studies** as part of the upgrading project, Mthatha to Qumbu, Eastern Cape, Client: UWP on behalf of SANRAL

Bloemsmond Solarfarms – **Transport Impact Assessment** for two solarfarms close to Upington in the Northern Cape, Client: Atlantic Energy Partners

Scatec Solarfarms – **Detailed design of access roads** for three solarfarms close to Upington, Client: Scatec Solar

Gravel Roads Upgrade for Fezile Dabi District, Free State, **Traffic Impact Investigation**, Client: Free State Province

R63 Rehabilitation between Alice and King Williams Town – **Traffic & NMT Study** for several intersections and accesses along this 60km long road in regards to pedestrian safety, Client: SANRAL

Zambia RD Rehabilitation – **Traffic Study and Advice** for the Rehabilitation of a 320km stretch of road in Zambia, Client: Government of Zambia

N2 Caledon to Riviersonderend – **Traffic and NMT safety audit** as part of the N2 Upgrade between Caledon and Riviersonderend, Client: SANRAL

MR529 Rehabilitation, Western Cape - **Conceptual designs for possible upgrades** to the intersections of the R27 and Voortrekker Street in Veldrift and the intersection of MR527 and MR529 close to Piketberg. Client: Western Cape Government (WCG)

SANRAL R61 Rehabilitation, Eastern Cape – **Traffic input into upgrading** requirements regarding NMT and public transport facilities, such as sidewalks, pedestrian bridges, taxi/bus stops. Client: SANRAL

Delft Housing Development – **Conceptual Planning of the Site Development Plan and Transport Impact Assessment** for a 700-residential unit development, Client: Onke Consulting

Nyanga Public Transport Node – **Traffic Study including Non-motorised Transport (NMT) and Public Transport Planning** as part of the Upgrade of the Nyanga Public Transport Node and surrounding area, Client: City of Cape Town

Durban RoRo Terminal Capacity Expansion – **Traffic Management Plan and Transport Impact Assessment** for the Expansion of Transnet's RoRo Terminal in the Durban Port, Client: Transnet Capital Projects

Transnet Traffic Management Plan – **Traffic Management Plan and Impact Assessment** for the Resurfacing of the Transnet Park Site in Port Elizabeth, Client: Transnet

Mthatha Landfill Site – **Traffic Impact Assessment** for the Development of a landfill site at Mthatha, Eastern Cape, Client: PASCO Waste & Environmental

Bellville Medical Centre, Bellville CBD – **Transport Impact Assessment** for the development of an educational medical facility for 2000 nursing students. Client: University of the Western Cape

Bloekombos District Hospital, Joostenberg – **Transport Impact Assessment** for the proposed development of a 300-room hospital and ambulant station including circulation of emergency vehicles, parking, access assessments, etc. Client: Western Cape Government

Stellenbosch School Precinct – **Transport Advice regarding improving traffic** operation of several intersections along Strand Street (R44), Van Rheede Street and Doornbosch Street including **assessment of accessibility**, possible pedestrian links between schools, recommendations on intersection upgrades and signal timing plans. Client: Stellenbosch Municipality

Secunda **Traffic Signals**, Mpumalanga - Investigating all signalized intersections in Secunda including site visits, capturing and analyzing intersections and establishing the timing plans and upgrades needs for SASOL Secunda. Client: SASOL

Transport Risk Assessments for Wind Farms, Western Cape - Conducting the transport risk assessments for the Trouberg, Bakenskop and Harpuisberg sites for Windlab including route assessments, abnormal load investigations and recommendation regarding port of entry and permits. Client: Windlab

Transport Risk Assessment for seven Solar Farms in the Western Cape - Conducting the route assessment including all relevant transportation matters for proposed sites close to De Doorns, Wolseley, Eendekuil, Riebeek Kasteel, McGregor, Bonnievale and Klipheuwel. Client: Sunspot

Traffic Impact Study for the Hintsabe Project, Eastern Cape - Conducting the traffic impact study for the Hintsabe Peddie mixed land use development close to East London. Client: GIBB Consulting / Eastern Cape Development Corporation (ECDC)

Bardale Village Phase 7, Western Cape - **Traffic engineering input** into the Site Development Plan including all key issues, such as accommodation of Public Transport and Non-motorised Transport services and facilities, among others. Client: Integrated Housing Development

Traffic Impact Study for Malabar Ext.6, Eastern Cape - Conducting the traffic impact study for the mixed land use development Malabar Extension 6 in Port Elizabeth including all transportation key Client: Nelson Mandela Bay Municipality (NMBM)

Traffic and Transportation Advice, Hiddingh Campus UCT, Cape Town - Traffic engineering advice for the revamp of the Hiddingh Campus of the University of Cape Town, Gardens. Client: University of Cape Town (UCT)

Transport Study for Industrial Development, Joostenberg Vlakte - Conducting transport study including capacity analyses, access management and input into SDP. Client: ASLA Developments

TR28/1 Dualing, Hermanus - Traffic signals and timing for several intersections along TR28/1. Client: WCG

Arup (Pty) Ltd

2012
Position – Senior Traffic & Transportation Engineer (from 2010)

Inner City Transport Plan for the City of Cape Town (CoCT) - Preparation of an **Inner City Transport Plan** creating a framework to allow stakeholders to understand priorities and process of the CoCT. Client: CoCT

Transport Assessments and Reviews for Renewable Energy Projects - Conducting transport assessments and reviews for a wide range of wind farm, solar and CSP farm projects in the Eastern, Northern and Western Cape, such as Renosterberg, Coega, St Helena Bay and Boschfontein. Clients: various

2006 – 2012

Position – Leading Traffic & Transportation Engineer

Eikestad Urban Renewal, Stellenbosch - Leading traffic engineer for Eikestad Urban Renewal responsible for all **traffic related matters** concerning this project including conducting the **traffic impact study**, input and assistance in ramp designs, access and parking layouts, upgrades of surrounding roads, implementation of improved NMT facilities, delivery management plans, design of loading areas, intermediate between client and municipality, etc. Client: Eikestad (Pty) Ltd

2004 – 2012
Position – Traffic & Transportation Engineer

Wide range of **Traffic Studies** in South Africa - Conducted a wide range of studies for projects in the Western Cape as well as Johannesburg, Pretoria and Mauritius including trip generation, trip distribution, traffic analyses, queuing analysis, ramp design calculations, conceptual designs and recommendations, such as Rosebank Gardens, Rosebank Mall, Ferndale Erf 389. Client: various

2009 – 2011
Position – Traffic & Transportation Engineer

Central Park Business Development, Vergenoegd Farm, Somerset West - **Traffic Study and traffic engineering advice** for the development of Farm 653/15, Vergenoegd for business purposes, including access control, advise in public transport and Non-motorised transport facilities, conceptual designs of the recommended upgrades of the surrounding road network as well as input into the EIA. Client: Urban Dynamics Western Cape (UDWC)

Gaborone NMT Facilities, Botswana - **Conceptual design of cycle and pedestrian facilities** as well as preparing the schedule of quantities Client: Gaborone City Council.

2008 – 2009
Position – Traffic & Transportation Engineer
West Coast IRT Corridor: NMT Integration, South Africa - **Development of conceptual designs of the non-motorised transport** components along the link roads within a 500m radius from the proposed IRT stations (Paarden Eiland, Milnerton, Tableview). Client: CoCT

DFA Campus, Tshwane - **Design and coordination of traffic signals** of existing intersections and the new access to the development along Soutpansberg Road as part of the new Department of Foreign Affairs (DFA) Head Office. Client: DFA

K29 Cosmo City, Johannesburg - **Design and coordination of signal timing plans** for the intersections of Hans Strijdom Road / Access Road A4 and Hans Strijdom Road / South Africa Drive. Client: City of Johannesburg

Traffic Signal Design, Cape Town - Detailed calculation of timing plans for signalized intersections including legal aspects, warranties, etc. for several projects around Cape Town. Client: various

2005 – 2008
Position – Graduate Traffic & Transportation Engineer

Klipfontein Corridor, Cape Town - **Traffic capacity analyses of intersections** with aaSIDRA software and assisting in establishing a model of the Klipfontein Corridor Spine with SATURN, conducting travel time surveys. Client: CoCT

Traffic Impact Review and Parking Assessment, Grand West Casino Extension, Cape Town - Reviewing the external traffic situation and impact by the development traffic for the extension of the Grand West Casino & Entertainment World, Cape Town. Parking assessment and review of internal traffic situation. Client: Grand West Casino

Presentation of RAIL CPTR Information for the City of Cape Town - Updating of the CPTR (Current Public Transport Record) information of the rail network for the City of Cape Town; sourcing all required data and studies; responsible for implementing the City of Cape Town rail network in electronic format. Client: CoCT

Schmidt Ingenieursbüro, Hanover, Germany

2000
Position – Engineering Assistant

Research, consultation and investigation of legal matters for several projects in line with the VOB/B (German Law of Construction Services). Clients: various

Leibniz University of Hanover, Germany (Institutes for Road & Railway Engineering)

2000
Position – Engineering Assistant

Upgrading of the B6 Expressway in Hanover, NLStb - **Conceptual designs for the bridge construction** at an intersection in Hanover/Garbsen. Client: Lower Saxonian State Office

2000 - 2003
Position – Scientific Research Assistant

Simulation of Railway Operations in the European Rail Network - Illustration of infrastructure costs, research of the circumference of facilities of the track support layer work and analyzing the feasibility of different extensive databases. Client: Deutsche Bahn (German Railway Company)

Technical University of Berlin & German Railroad Company (Die Bahn), Germany

2003
Position – Scientific Research Assistant, Master Thesis

Investigation of the allocation of access rights to the European rail network infrastructure - Research of the feasibility of the different bidding processes to allocate access rights of railway operators in the European railway market. Client: Technical University of Berlin and German Railway Company.

CONTINUED PROFESSIONAL DEVELOPMENT

Courses

2006 - Highway Capacity Analysis (SARF)

2006 - Management of Transport Supply and Demand (UCT)

2007 - Traffic Signal Design (SARF)

2008 - Preparation of Contract Documentation (SARF)

2008 - Traffic Calming and Road Safety (SARF)

2009 - Geometric Design of Urban and Rural Roads (SARF)

2009 - Non-motorised Transport (SARF)

2010 - An IRT System for Cape Town (SARF)

2010 - HCM 2010 Seminar (SAICE)

2010 - SADC Road Traffic Signs Manual (SARF)

2010 - ITS Workshop (ITS SA)

2010 - Road Marking (SARF)

2010 - Public Transport Options (SARF)

2011 - EIA for Roads in South Africa (SARF)

2011 - Transport Demand and Supply (UCT)

2012 - BRT Lessons Learnt (SARF)

2012 - Handling Projects in a Consulting Engineering Practise (CESA/SAICE)

2013 - Optimizing Intersections (SARF)

2013 - Winning Tenders (CESA)

2013 - Transport Logistics: Wind Turbines (SARF)

2014 - Traffic Safety Officer & Roads Audit Course (SARF)

2014 - Traffic Signal Optimization (SARF)

2015 - Road Safety Auditor Course (SARF)

2015 - Non-motorised Transport Planning (SARF)

2016 - SATC Road Safety Audit Workshop Pretoria (SARF)

2018 – Road Safety in Engineering (SARF)

2018 – IRF/SARF/PIARC Road Engineering Conference Durban

PERSONAL DETAILS

Nationality – German (permanent Residency in RSA)
Date of Birth – 1976-10-12
Domicile – Cape Town, South Africa

Languages
English – Very Good
German – Native Language
Afrikaans – Fair

Appendix 3

Declarations of Interest and the EAP Affirmation

Specialist Declaration

I, Johann Lanz, as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- I act as the independent specialist in this application;
- I perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have no vested interest in the proposed activity proceeding;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Name of company: Johann Lanz – Soil Scientist

Professional Registration (including number): SACNASP Reg. no. 400268/12

Date: 31 October 2018

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Environmental Impact Assessment (EIA) For the Proposed 325mw Rondekop Wind Energy Facility Between Matjiesfontein And Sutherland In The Northern Cape Province

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	EnviroSci (Pty) Ltd			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	100
Specialist name:	Dr Brian Colloty			
Specialist Qualifications:	Ph.D in wetland and aquatic systems conservation rating and mapping			
Professional affiliation/registration:	SACNASP Pr Sci Nat Ecologist 400268/07 Member of the South African Wetland Society,			
Physical address:	1 Rossini Rd Pari Park Port Elizabeth			
Postal address:	1 Rossini Rd Pari Park Port Elizabeth			
Postal code:	6070	Cell:	0834983299	
Telephone:	0413662077	Fax:	-	
E-mail:	b.colloty@gmail.com			

2. DECLARATION BY THE SPECIALIST

I, Brian Colloty, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

EnviroSci (Pty) Ltd

Name of Company:

6 November 2018

Date

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Environmental Impact Assessment (EIA) For The Proposed 325mw Rondekop Wind Energy Facility Between Matjiesfontein And Sutherland In The Northern Cape Province

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Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	Bioinsight (Pty) Ltd.			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	100%
Specialist name:	Miguel Mascarenhas and/or Craig Campbell			
Specialist Qualifications:	Post Graduate (Business Management), MSc (Environmental Impact Assessments), BSc (Applied Plant Biology)			
Professional affiliation/registration:	Miguel Mascarenhas: SACNASP | Ecological Science | Reg. 400168/14			
Physical address:	Rua Antero de Quental, N°52 Loja B, Urbanizacao Colinas do Cruzeiro, 2675-690, Odivelas, Portugal			
Postal address:	Unit 306, Warwick Place, 113 Grand National Boulevard, Milnerton			
Postal code:	7441	Cell:	+27 82 353 6515	
Telephone:	n/a	Fax:	n/a	
E-mail:	info@bioinsight.co.za / craig.c@bioinsight.co.za			

2. DECLARATION BY THE SPECIALIST

I, Miguel Rodolfo Teixeira de Mascarenhas, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Miguel Rodolfo Teixeira de Mascarenhas

Signature of the Specialist

Bioinsight (Pty) Ltd.

Name of Company:

12th November 2018

Date

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

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PROJECT TITLE

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Email: EIAAdmin@environment.gov.za

1. ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP) INFORMATION

EAP Company Name:	SiVEST			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	3	Percentage Procurement recognition	110
EAP name:	Andrea Gibb			
EAP Qualifications:	B.Sc. (Hons) Environmental Management (UNISA) BSc Landscape Architecture *Cum Laude* (UP)			
Professional affiliation/registration:	None			
Physical address:	51 Wessels Road, Rivonia			
Postal address:	PO Box 2921, Rivonia			
Postal code:	2128	Cell:	072 587 6525	
Telephone:	011 798 0638	Fax:	011 803 7272	
E-mail:	andreag@sivest.co.za			

The appointed EAP must meet the requirements of Regulation 13 of GN R982 of 04 December 2014, as amended.

2. DECLARATION BY THE EAP

I, **Andrea Gibb**, declare that –

- I act as the independent environmental assessment practitioner in this application;
- I have expertise in conducting environmental impact assessments, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I will take into account, to the extent possible, the matters listed in Regulation 13 of the Regulations when preparing the application and any report relating to the application;
- I undertake to disclose to the applicant and the Competent Authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the Competent Authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the Competent Authority, unless access to that information is protected by law, in which case it will be indicated that such information exists and will be provided to the Competent Authority;
- I will perform all obligations as expected from an environmental assessment practitioner in terms of the Regulations; and
- I am aware of what constitutes an offence in terms of Regulation 48 and that a person convicted of an offence in terms of Regulation 48(1) is liable to the penalties as contemplated in Section 49B of the Act.

Disclosure of Vested Interest (delete whichever is not applicable)

- I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations;

- ~~I have a vested interest in the proposed activity proceeding, such vested interest being~~:

____

____

____

____

Signature of the Environmental Assessment Practitioner

SiVEST SA (Pty) Ltd
Name of Company:

13/ 11 /2018
Date

3. **UNDERTAKING UNDER OATH/ AFFIRMATION**

I, Andrea Gibb, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Environmental Assessment Practitioner

SiVEST SA (Pty) Ltd
Name of Company

13/ 11 / 2018
Date

Signature of the Commissioner of Oaths

2018/11/13
Date

SOUTH AFRICAN POLICE SERVICE
COMMUNITY SERVICE CENTRE
13 -11- 2018
BRACKENDOWNS
EASTRAND
SOUTH AFRICAN POLICE SERVICE

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

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Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Rondekop Wind Energy Facility

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Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	PGS Heritage (Pty) Ltd			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	
Specialist name:	Marko Hutten			
Specialist Qualifications:	BA Hons. (Archaeology)			
Professional affiliation/registration:	Member of Association of Southern African Professional Archaeologists (ASAPA)			
Physical address:	906 Bergarend Street, Waverley, Pretoria, 0186			
Postal address:	PO Box 32542, Totiusdal			
Postal code:	0134	Cell:	076 038 4185	
Telephone:	012 332 5305	Fax:	086 675 8077	
E-mail:	marko@pgsheritage.co.za			

2. DECLARATION BY THE SPECIALIST

I, __Marko Hutten____, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

PGS Heritage (Pty) Ltd

Name of Company:

14/01/2019

Date

Declaration of Independence

I, Ilan Smeyatsky,

as the appointed independent noise specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- I act as the independent specialist in this application;
- I perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have no vested interest in the proposed activity proceeding;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Disclosure of Vested Interest

I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations;

HERITAGE CONSULTANT: PGS Heritage (Pty) Ltd

CONTACT PERSON: Ilan Smeyatsky - Archaeologist

Tel: +27 (0) 12 332 5305

Email:Ilan@pgsheritage.co.za

SIGNATURE: ______________

Report Title	**ENVIRONMENTAL IMPACT ASSESSMENT (EIA) FOR THE PROPOSED 325MW RONDEKOP WIND ENERGY FACILITY**

	BETWEEN MATJIESFONTEIN SUTHERLAND IN THE NORTHERN CAPE PROVINCE: HERITAGE IMPACT ASSESSMENT		
Control	**Name**	**Signature**	**Designation**
Author	Ilan Smeyatsky		Archaeologist/ PGS Heritage
Co-author	Marko Hutten		Archaeologist/PGS Heritage
Reviewed	Wouter Fourie		Principal Heritage Specialist
Reviewed	Andrea Gibb		SiVest/Environmental Division

Date:	*07 11 2018*
Document Title:	Heritage Impact Report
Author:	*Ilan Smeyatsky, Marko Hutten, Wouter Fourie*
Revision Number:	*0.3*
Checked by:	*Andrea Gibb*
For:	*SiVEST SA (PTY) Ltd*

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

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Arcadia

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Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	PGS Heritage (Pty) Ltd			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	8	Percentage Procurement recognition	10%
Specialist name:	Wouter Fourie – Lead Heritage Specialist			
Specialist Qualifications:	BA(Hon) Archaeology			
Professional affiliation/registration:	ASAPA, APHP			
Physical address:	906 Bergarend Street, Waverley, Pretoria			
Postal address:	PO Box 32542, Totiusdal			
Postal code:	0134	Cell:	082851 3575	
Telephone:	012 332 5305	Fax:		
E-mail:	wouter@pgsheritage.co.za			

2. DECLARATION BY THE SPECIALIST

I, ________Wouter Fourie___________________________, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
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- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

PGS Heritage Pty Ltd

Name of Company:

8 November 2018

Date

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

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1. SPECIALIST INFORMATION

Specialist Company Name:	SAFETECH			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	NON-COMPLIANT	Percentage Procurement recognition	0
Specialist name:	BRETT WILLIAMS			
Specialist Qualifications:	PHD			
Professional affiliation/registration:	REGISTERED OCCUPATIONAL HYGIENIST			
Physical address:	64 WORRAKER STREET NEWTON PARK PORT ELIZABETH			
Postal address:	PO BOX 27607, GREENACRES			
Postal code:	6057	Cell:	0825502137	
Telephone:	041-3656846	Fax:	041-3652123	
E-mail:	Brett.williams@safetech.co.za			

2. DECLARATION BY THE SPECIALIST

I, _BRETT WILLIAMS________________________, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

____

Signature of the Specialist

SAFETECH

Name of Company:

13/11/2018

Date

H. BARNARD

13/11/2018

Boog Street	Boog Straat
P.O.Box 4	Posbus 4
Humansdorp	Humansdorp
Commissioner of Oaths	Kommissaris van Ede
Ex-Officio	Ex-Officio
Chartered Accountant (SA)	Geoktrooieerde Rekenmeester (SA)

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

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1. SPECIALIST INFORMATION

Specialist Company Name:	Banzai Environmental Pty Ltd			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	Level 4	Percentage Procurement recognition	
Specialist name:	Elize Butler			
Specialist Qualifications:	MSc			
Professional affiliation/registration:	PSSA			
Physical address:	14 Eddie De Beer Street , Dan Pienaar, Bloemfontein, 9301			
Postal address:	14 Eddie De Beer Street , Dan Pienaar, Bloemfontein, 9301			
Postal code:	9301	Cell:	084 447759	
Telephone:	084 447759	Fax:		
E-mail:	elizebutler002@gmail.com			

2. DECLARATION BY THE SPECIALIST

I, __________Elize Butler______________________, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

Banzai Environmental Pty Ltd

Name of Company:

11-11-2018

Date

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Environmental Impact Assessment (EIA) For The Proposed 325mw Rondekop Wind Energy Facility Between Matjiesfontein And Sutherland In The Northern Cape Province

Kindly note the following:

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5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	Dr Neville Bews & Associates			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	NA no additional staff	Percentage Procurement recognition	
Specialist name:	Neville Bews			
Specialist Qualifications:	D. Litt. et Phil.			
Professional affiliation/registration:	International Association for Impact Assessment (IAIAsa). Membership Number: 2399			
Physical address:	84 Hennie Alberts Street, Brackenhurst, Alberton			
Postal address:	P.O. Box 145412, Bracken Gardens			
Postal code:	1452	Cell:	082 557-3489	
Telephone:	011 867-0462	Fax:	086 621-8345	
E-mail:	bewsco@netactive.co.za			

2. DECLARATION BY THE SPECIALIST

I, Neville Bews, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

Dr Neville Bews & Associates

Name of Company:

07th November, 2018

Date

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

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File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Environmental Impact Assessment (EIA) For The Proposed 325mw Rondekop Wind Energy Facility Between Matjiesfontein And Sutherland In The Northern Cape Province

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Pretoria
0001

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Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	David Hoare Consulting (Pty) Ltd			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	0
Specialist name:	David Hoare			
Specialist Qualifications:	PhD			
Professional affiliation/registration:	SACNASP (Reg No 400221/05)			
Physical address:	41 Soetdoring Avenue, Lynnwood Manor, Pretoria, 0081			
Postal address:	Postnet Suite 116, Private Bag X025, Lynnwood Ridge			
Postal code:	0040	Cell:	083 284 5711	
Telephone:	012 804 2281	Fax:	086 550 2053	
E-mail:	dhoare@lantic.net			

2. DECLARATION BY THE SPECIALIST

I, Dr David Hoare, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

David Hoare Consulting (Pty) Ltd
Name of Company:

11 November 2018
Date

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

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File Reference Number:	
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473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	JG AFRIKA (PTY) LTD			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	1	Percentage Procurement recognition	135%
Specialist name:	IRIS WINK			
Specialist Qualifications:	MSC ENG (CIVIL & TRANSPORTATION)			
Professional affiliation/registration:	PRENG (20110156)			
Physical address:	14 CENTRAL SQUARE, PINELANDS			
Postal address:	PO Box 38561, PINELANDS			
Postal code:	7430	Cell:	082 691 9096	
Telephone:	021 530 1800	Fax:	021 532 0950	
E-mail:	wink@jgafrika.com			

2. DECLARATION BY THE SPECIALIST

I, IRIS WINK, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

JG AFRIKA (PTY) LTD

Name of Company:

08/11/2018

Date

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

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PROJECT TITLE

Environmental Impact Assessment (EIA) For The Proposed 325mw Rondekop Wind Energy Facility Between Matjiesfontein And Sutherland In The Northern Cape Province

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Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	SRK Consulting (South Africa) (Pty) Ltd			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	2	Percentage Procurement recognition	125%
Specialist name:	Scott Masson			
Specialist Qualifications:	BSc (Hons) (Environ. Man.); MLA (L. Arch)			
Professional affiliation/registration:	Certified Environmental Assessment Practitioner			
Physical address:	The Admin Building, Albion Springs, 183 Main Road, Rondebosch, 7700			
Postal address:	Postnet Suite #206, P. Bag X18, Rondebosch			
Postal code:	7701	Cell:	072 134 6897	
Telephone:	021 659 3060	Fax:	086 530 7003	
E-mail:	smasson@srk.co.za			

2. DECLARATION BY THE SPECIALIST

I, Scott Masson, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

SRK Consulting (South Africa) (Pty) Ltd

Name of Company:

13/11/2018

Date

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Rondekop WEF

Kindly note the following:

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Attention: Chief Director: Integrated Environmental Authorisations
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Pretoria
0001

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Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	SRK Consulting (South Africa) (Pty) Ltd			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	2	Percentage Procurement recognition	
Specialist name:	Christopher Dalgliesh			
Specialist Qualifications:	MPhil (EnvSci) with Distinction, Cape Town, 1994 BBusSc (Hons), Cape Town, 1985			
Professional affiliation/registration:	Cert Envir Assessment Practitioner (South Africa) (10/2002) Member International Association of Impact Assessment			
Physical address:	The Administrative Building, Albion Springs, 183 Main Road, Rondebosch, 7700			
Postal address:	Postnet Suite #206, P.Bag X18, Rondebosch			
Postal code:	7701	Cell:	083 635 8769	
Telephone:	021 659 3060	Fax:	021 685 7105	
E-mail:	cdalgliesh@srk.co.za			

2. DECLARATION BY THE SPECIALIST

I, _Christopher Dalgliesh________________________, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
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- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

SRK Consulting (South Africa) PTY LTD

Name of Company:

19/12/2018

Date

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
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Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Environmental Impact Assessment (EIA) For The Proposed 325mw Rondekop Wind Energy Facility Between Matjiesfontein And Sutherland In The Northern Cape Province

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Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	SiVEST			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	3	Percentage Procurement recognition	110
Specialist name:	Kerry Schwartz			
Specialist Qualifications:	BA			
Professional affiliation/registration:	SAGC (GISc Technician)			
Physical address:	51 Wessels Road, Rivonia			
Postal address:	PO Box 2921, Rivonia			
Postal code:	2128	Cell:		
Telephone:	011 798 0632	Fax:	011 8037272	
E-mail:	kerrys@sivest.co.za			

2. DECLARATION BY THE SPECIALIST

I, **Kerry Schwartz**, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
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- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

KSchwartz

Signature of the Specialist

SiVEST

Name of Company:

16 October 2018

Date

Appendix 4
Authority Consultation

SiVEST Environmental
51 Wessel Road, Rivonia
PO Box 2921, Rivonia
2128
Gauteng, South Africa
Phone + 27 11 798 0600
Fax + 27 11 803 7272
Email info@sivest.co.za
www.sivest.co.za
Established 1952

Department of Environmental Affairs
Environment House
473 Steve Biko
Arcadia
PRETORIA
0083

DEA Reference: TBC
Our reference: 15260
Date: 14 November 2018

ATTENTION: CHIEF DIRECTOR - INTEGRATED AUTHORISATIONS

Dear Sir/Madam

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) FOR THE PROPOSED 325MW RONDEKOP WIND ENERGY FACILITY BETWEEN MATJIESFONTEIN AND SUTHERLAND IN THE NORTHERN CAPE PROVINCE

SiVEST is in the process of undertaking the Environmental Impact Assessment (EIA) for the proposed development of the above mentioned Wind Farm near Sutherland in the Northern Cape Province.

Please find herewith two (2) hard copies of the Application Form for Environmental Authorisation and two (2) hard copies of Draft Scoping Reports (DSRs), one (1) electronic copy (on USB) of the Application Form for Environmental Authorisation and one (1) electronic copy (on USB) of the DSR, for the above mentioned proposed project.

Please do not hesitate to contact us should you have any queries in this regard.

Andrea Gibb
SiVEST Environmental
P O Box 2921 RIVONIA
2128

Tel: (011) 798 0600
Fax: (011) 803 7272
Website: www.sivest.co.za
E-mail: andreag@sivest.co.za

Yours sincerely

Shivani Naidoo
Environmental Consultant
SiVEST Environmental Division

Encl: 2 x Hard copies of the DSR (Incl. Appendices)
2 x Hard copies of the Application Form (Incl. Appendices)
1 x Electronic copy (on USB) of the DSR (Incl. Appendices)
1 x Electronic copy (on USB) of the Application Form (Incl. Appendices)

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X 447· PRETORIA · 0001· Environment House · 473 Steve Biko Road, Arcadia · PRETORIA

DEA Reference: 14/12/16/3/3/2/1115
Enquiries: Azrah Essop
Tel: 012 399 8529 **E-mail:** AEssop@environment.gov.za

Andrea Gibb
SiVEST SA (Pty) Ltd
P O Box 2921
RIVONIA
2128

Tel: 011 798 0638
Email: andreag@sivest.co.za

PER EMAIL / MAIL

Dear Sir/Madam

ACKNOWLEDGEMENT OF RECEIPT OF THE NEW APPLICATION FOR ENVIRONMENTAL AUTHORISATION (ENVIRONMENTAL IMPACT ASSESSMENT PROCESS) AND SCOPING REPORT FOR THE PROPOSED CONSTRUCTION OF THE 325MW RONDEKOP WIND ENERGY FACILITY BETWEEN MATJIESFONTEIN AND SUTHERLAND IN THE NORTHERN CAPE PROVINCE

The Department confirms having received the Application and draft Scoping Report for Environmental Authorisation for the abovementioned project on 14 November 2018. We further confirm that you have submitted these documents to comply with the National Environmental Management Act, 1998 (Act No. 107 of 1998) Environmental Impact Assessment Regulations, 2014 published under Government Notice R982 in Government Gazette No. 38282 dated 04 December 2014, as amended ('the EIA Regulations, 2014').

Please take note of Regulation 40(3) of the EIA Regulations, 2014 which states that potential Interested & Affected Parties, including the Competent Authority, may be provided with an opportunity to comment on reports and plans contemplated in Regulation 40(1) of the EIA Regulations, 2014, prior to the submission of an application but must be provided an opportunity to comment on such reports once an application has been submitted to the Competent Authority.

Note that in terms of Regulation 45 of the EIA Regulations, 2014 this application will lapse if the applicant fails to meet any of the time-frames prescribed in terms of these Regulations, unless an extension has been granted by the Department in terms of Regulation 3(7) of the EIA Regulations, 2014.

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You are hereby reminded of Section 24F of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended, that no activity may commence prior to an Environmental Authorisation being granted by the Department.

Kindly quote the abovementioned reference number in any future correspondence in respect of the application.

Yours sincerely

Mr Sabelo Malaza
Chief Director: Integrated Environmental Authorisations
Department of Environmental Affairs
Letter signed by: Ms Azrah Essop
Designation: Environmental Officer: EIA Coordination, Strategic Planning and Support
Date: 19 November 2018

CC:	Dr Kilian Hagemann	Rondekop Wind Farm (Pty) Ltd	Email: rondekop@g7energies.com
	Thulani Mthombeni	Northern Cape Department of Environment and Nature Conservation (DENC)	Email: tmthombeni@ncpg.gov.za
	Allistar Gibbons	Karoo Hoogland Local Municipality	Email: a.gibbons@karoohoogland.gov.za

Liandra Scott-Shaw

From:	Azrah Essop <AEssop@environment.gov.za>
Sent:	Tuesday, 27 November 2018 2:46 PM
To:	Liandra Scott-Shaw
Cc:	Andrea Gibb; Hlengiwe Ntuli; Constance Musemburi
Subject:	RE: 15260- DEA Ref: 14/12/16/3/3/2/1115 -THE PROPOSED CONSTRUCTION OF THE 325MW RONDEKOP WIND ENERGY FACILITY

Dear Liandra
Noted, Additonally please note, your case officer is Ms Constance Musemburi.

Azrah Essop
Integrated Environmental Authorisations:
Coordination, Strategic Planning and Support
Tel: (012) 399 8529
Email: AEssop@environment.gov.za

Please be informed that the Departmental EIA related templates were updated. It can be downloaded from the Departmental web address at https://www.environment.gov.za/documents/forms#legal_authorisations. From 05 January 2019 no outdated EIA related templates will be accepted and you will be required to resubmit your Application Form in the correct version and format in order for it to be considered as having been received by the Department.

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

From: Liandra Scott-Shaw [mailto:LiandraS@sivest.co.za]
Sent: 27 November 2018 02:43 PM
To: Azrah Essop
Cc: Andrea Gibb; Hlengiwe Ntuli
Subject: 15260- DEA Ref: 14/12/16/3/3/2/1115 -THE PROPOSED CONSTRUCTION OF THE 325MW RONDEKOP WIND ENERGY FACILITY

Dear Ms Essop

Please find attached the Landowner Consent letter that was omitted from the hard copy of the Application (DEA Ref: 14/12/16/3/3/2/1115) submitted 14 November 2018.

The letter was unable to open and thus was not printed, the corrupt PDF version was included in the electronic copy of the Application.

Please could you kindly replace the corrupt version with the version attached:

Thank you in advance

Kind regards

Liandra Scott-Shaw *(Pr.Sci.Nat)*
Environmental Scientist
SiVEST Environmental Division

SiVEST is a Level 3 BBBEE Contributor

T +27 33 347 1600 | **M** +2773 658 7955 | **E** liandras@sivest.co.za | **W** www.sivest.co.za

Engineering Consulting | Project Management | Environmental Consulting | Town & Regional Planning | Management Systems Consulting

Durban | Johannesburg | Pretoria | Pietermaritzburg | Richards Bay | Port Louis (Mauritius)

'Please consider the environment before you print this email'

DEA Reference: 14/12/16/3/3/2/1115
Enquiries: Constance Musemburi
Telephone: (012) 399 9416 **E-mail:** Cmusemburi@environment.gov.za

Ms Andrea Gibb
SiVest SA (Pty) Ltd.
P. O. Box 2921
RIVONIA
2128

Tel No: 011 798 0638
Email: andreag@sivest.co.za

ER E-MAIL / MAIL

Dear Madam

COMMENTS ON THE DRAFT SCOPING REPORT FOR THE PROPOSED CONSTRUCTION OF THE 325MW RONDEKOP WIND ENERGY FACILITY BETWEEN MATJIESFONTEIN AND SUTHERLAND, NORTHERN CAPE PROVINCCE.

The application form and the draft Scoping Report (SR) received by this Department on 14 November 2018 and the acknowledgement thereof dated 19 November 2018 refers.

This Department has the following comments on the abovementioned application:

i. This Department has noted the use of the word **"may, will likely"**, when describing the project activity that triggers the listed activities applied for. The use of these words show that the EAP/applicant is not confident and/or is uncertain as to why the listed activities applied for are being triggered by the proposed activity. You are therefore required to rephrase all project activity descriptions to refrain from the use of these words. **The onus is on the applicant to ensure that only the applicable listed activities are included in the application form.** A full assessment of impacts and proposed mitigation thereto of all the triggered activities must be provided in the final SR.

ii. Please ensure that **the relevant listed activities are applied for, are specific and that it can be linked to the development activity or infrastructure as described in the project description.**

iii. If the activities applied for in the application form differ from those mentioned in the final SR, an amended application form must be submitted. Please note that the Department's application form template has been amended and can be downloaded from the following link https://www.environment.gov.za/documents/forms.

iv. Please ensure that all issues raised and comments received during the circulation of the draft SR from registered I&APs and organs of state which have jurisdiction in respect of the proposed activity are adequately addressed in the Final SR. Proof of correspondence with the various stakeholders must be included in the Final SR. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments. The Public Participation Process must be conducted in terms of Regulation 39, 40, 41, 42, 43 & 44 of the EIA Regulations 2014.

v. Please provide a description of any identified alternatives for the proposed activity that are feasible and reasonable, including the advantages and disadvantages that the proposed activity or alternatives will have on the environment and on the community that may be affected by the activity as per Appendix 2 (1) (c) (d) and 2 (h) of GN R.982 of 2014. Alternatively, you should submit written proof of an investigation and motivation if no reasonable or feasible alternatives exist in terms of Appendix 2 (2)(x)(xi).

vi. In accordance with Appendix 2 (2) (a) of the EIA Regulations 2014, the details of—

(i) the EAP who prepared the report; and

(ii) the expertise of the EAP to carry out Scoping and Environmental Impact assessment procedures; must be submitted.

vii. Please ensure that the final SR includes a legible site layout map; an environmental sensitivity map indicating all environmental sensitive areas and features; a map combining a layout map superimposed (overlain) on the environmental sensitivity map; and a regional map of the area.

viii. You are further reminded that the final SR to be submitted to this Department must comply with all the requirements in terms of the scope of assessment and content of Scoping reports in accordance with Appendix 2 and Regulation 21(1) of the EIA Regulations, 2014.

ix. Please ensure that a CD/flash drive is submitted together with your FSR.

x. Further note that in terms of Regulation 45 of the EIA Regulations 2014, this application will lapse if the applicant fails to meet any of the timeframes prescribed in terms of the these Regulations, unless an extension has been granted in terms of Regulation 3(7).

You are hereby reminded of Section 24F of the National Environmental Management Act, Act No 107 of 1998, as amended, that no activity may commence prior to an environmental authorisation being granted by the Department.

Yours sincerely

Mr Sabelo Malaza
Chief Director: Integrated Environmental Authorisations
Department of Environmental Affairs
Signed by: Mr. Wayne Hector
Designation: Deputy Director: Strategic Infrastructure Developments
Date: 07/12/18

cc:	Dr Kilian Hagemann	Rondekop Wind Farm (Pty) Ltd	Tel no: 021 300 0613	Email: rondekop@g7energies.com

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X 447· PRETORIA · 0001· Environment House· 473 Steve Biko Road · PRETORIA

Ref: 14/12/16/N2
Enquiries: Ms Azrah Essop
Tel: 012 399 8529 **Email:** EIAadmin@environment.gov.za

Dear Sir/Madam

SUBMISSION OF DOCUMENTS TO THE DEPARTMENT IN TERMS OF THE NEMA EIA REGULATIONS, 2014, AS AMENDED AND CLOSURE OF THE DEPARTMENT.

Kindly take note of the following:
Please be herewith informed that in terms of Regulation 3(2) of the Regulations, 2014, as amended, it is stated that **"for any action contemplated in terms of these Regulations for which a timeframe is prescribed, the period of 15 December 2018 to 5 January 2019 must be excluded in the reckoning of days."**

The last day for receiving any documentation contemplated in terms of the EIA Regulations, 2014, as amended will be on **14 December 2018**. All documentation delivered to the physical address of this Department must be delivered during the official Departmental Office Hours which is visible on the Departmental gate. EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted.

However, should any documents be received during the period mentioned above, it will be regarded as having been received in terms of Regulation 3(1) of the Regulations, 2014, as amended on **07 January 2019**.

Further please be herewith informed that the last day that the Offices of the Department of Environmental Affairs will be open to the public is on **21 December 2018 until 10h00** in the morning, where after it will be closed and will re-open to the public on **02 January 2019 at 7h00**.

Yours faithfully

Mr Sabelo Malaza
Chief Director: Integrated Environmental Authorisations
Department of Environmental Affairs
Date: 19/11/2018

SiVEST
Environmental

VCC Estate, North View Building,
170 Peter Brown Drive, Montrose,
Pietermaritzburg 3201
PO Box 707, Msunduzi 3231
KwaZulu-Natal, South Africa

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www.sivest.co.za

Established 1952

Department of Environmental Affairs
Environment House
473 Steve Biko
Arcadia
PRETORIA
0083

DEA Reference: **14/12/16/3/3/2/1115**
Our reference: 15260
Date: 14 January 2019

ATTENTION: CONSTANCE MUSEMBURI.

Dear Constance Musemburi.

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) FOR THE PROPOSED DEVELOPMENT OF THE 325MW RONDEKOP WIND ENERGY FACILITY BETWEEN MATJIESFONTEIN AND SUTHERLAND, NORTHERN CAPE PROVINCE

SiVEST is in the process of undertaking the Environmental Impact Assessment (EIA) for the proposed development of the above mentioned Wind Energy Facility (WEF) in the Northern Cape Province.

Following the public comment and review period of the Draft Scoping Report (DSR) for the above-mentioned project from Wednesday the 14th of November 2018 to Friday the 14th of December 2018 (end of business day) the DSR was updated, taking into consideration the issues and concerns raised by stakeholders.

As such, please find herewith two (2) hard copy of the Final Scoping Report (FSR) and one (1) electronic copy (on USB) of the FSR, for the above mentioned proposed project.

Please do not hesitate to contact us should you have any queries in this regard.

Andrea Gibb
PO BOX 2921, Rivonia, 2128
Tel – (011) 798 0600
Fax – (011) 803 7272
Email – andreag@sivest.co.za

Yours sincerely,

Andrea Gibb
Divisional Manager
SiVEST Environmental Division

Encl: 2 x Hard copy of the FSR (Incl. Appendices)
1 x Electronic copy (on USB) of the FSR (Incl. Appendices)

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X 447· PRETORIA · 0001· Environment House · 473 Steve Biko Road, Arcadia · PRETORIA

DEA Reference: 14/12/16/3/3/2/1115
Enquiries: Azrah Essop
Tel: 012 399 8529 **E-mail:** AEssop@environment.gov.za

Andrea Gibb
Sivest SA (Pty) Ltd
P O Box 2921
RIVONIA
2128

Tel: 011 798 0600
Email: andreag@sivest.co.za

PER EMAIL / MAIL

Dear Sir/ Madam

ACKNOWLEDGEMENT OF RECEIPT OF THE FINAL SCOPING REPORT FOR THE PROPOSED DEVELOPMENT OF THE 32MW RONDEKOP WIND ENERGY FACILITY BETWEEN MATJIESFONTEIN AND SUTHERLAND, NORTHEN CAPE PROVINCE.

The Department confirms having received the final Scoping Report for the abovementioned project on 15 January 2019. You have submitted these documents to comply with the Environmental Impact Assessment (EIA) Regulations, 2014, as amended.

Please take note of Regulation 40(3) of the EIA Regulations, 2014, as amended, which states that potential Interested & Affected Parties, including the Competent Authority, may be provided with an opportunity to comment on reports and plans contemplated in Regulation 40(1) of the EIA Regulations, 2014, as amended, prior to the submission of an application but must be provided an opportunity to comment on such reports once an application has been submitted to the Competent Authority.

Note that in terms of Regulation 45 of the EIA Regulations, 2014, as amended, this application will lapse if the applicant fails to meet any of the time-frames prescribed in terms of these Regulations, unless an extension has been granted by the Department in terms of Regulation 3(7) of the EIA Regulations, 2014, as amended.

All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Office Hours which is visible on the Departmental gate.
EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted.

You are hereby reminded of Section 24F of the National Environmental Management Act, Act No. 107 of 1998, as amended, that no activity may commence prior to an Environmental Authorisation being granted by the Department.

Kindly quote the abovementioned reference number in any future correspondence in respect of the application.

Yours sincerely

Mr Sabelo Malaza
Chief Director: Integrated Environmental Authorisations
Department of Environmental Affairs
Letter signed by: Mrs Azrah Essop
Designation: Environmental Officer: EIA Coordination, Strategic Planning and Support
Date: 17/01/2019

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X 447· PRETORIA · 0001· Environment House · 473 Steve Biko Road · Arcadia · PRETORIA

DEA Reference: 14/12/16/3/3/2/1115
Enquiries: Mr Vincent Chauke
Telephone: (012) 399 9399 **E-mail:** vchauke@environment.gov.za

Ms Andrea Gibb
SiVEST SA (Pty) Ltd.
P.O. Box 2921
RIVONIA
2128

Tel No: (011) 798 0638
E-mail: andreag@sivest.co.za

PER E-MAIL / MAIL

Dear Ms Gibb

ACCEPTANCE OF THE SCOPING REPORT FOR THE PROPOSED CONSTRUCTION OF THE 325MW RONDEKOP WIND ENERGY FACILITY BETWEEN MATJIESFONTEIN AND SUTHERLAND, NORTHERN CAPE PROVINCE

The Scoping Report (SR) and Plan of Study for Environmental Impact Assessment (PoSEIA) dated 14 January 2019 and received by this Department on 15 January 2019 refer.

This Department has evaluated the submitted SR and the PoSEIA dated 14 January 2019 and is satisfied that the documents comply with the minimum requirements of the Environmental Impact Assessment (EIA) Regulations, 2014, as amended. The SR is hereby accepted by the Department in terms of Regulation 22 (a) of the EIA Regulations, 2014, as amended.

You may proceed with the Environmental Impact Assessment process in accordance with the tasks contemplated in the PoSEIA and the requirements of the EIA Regulations, 2014, as amended.

All comments and recommendations made by all stakeholders and various Interested and Affected Parties (I&APs) in the draft SR and submitted as part of the final SR must be taken into consideration when preparing an Environmental Impact Assessment report (EIAr) in respect of the proposed development. Please ensure that all mitigation measures and recommendations in the specialist studies are addressed and included in the final EIAr and Environmental Management Programme (EMPr).

Please ensure that comments from all relevant stakeholders are submitted to the Department with the EIAr. This includes but is not limited to:

- The National Department of Environmental Affairs: Directorate Biodiversity and Conservation Management,
- The Northern Cape Department of Nature and Conservation (DENC),
- The Department of Agriculture, Forestry and Fisheries (DAFF),
- The provincial Department of Agriculture,
- The South African Civil Aviation Authority (SACAA),
- The Department of Transport,

- The Department of Water and Sanitation (DWS),
- The South African National Roads Agency Limited (SANRAL),
- The South African Heritage Resources Agency (SAHRA),
- The Endangered Wildlife Trust (EWT),
- BirdLife SA,
- Square Kilometre Array (SKA) and
- The South African Astronomy Observation (SAAO).

You are also required to address all issues raised by Organs of State and I&APs prior to the submission of the EIAr to the Department.

Proof of correspondence with the various stakeholders must be included in the EIAr. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments.

The EAP must, in order to give effect to Regulation 7, give registered I&APs access to, and an opportunity to comment on the report in writing within 30 days before submitting the final EIAr to the Department.

In addition, the following additional information is required for the EIAr:

a) It is noted that the application does not include Activity 14 of GN R. 983, as amended, for the development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres. This Department draw to your attention that it is the onus of the EAP/Applicant to ensure that all applicable listed activities are applied for and are included in the application form for environmental authorisation as this activity can be potentially triggered by the proposed facility.
b) Please note that the activity description for Activity 15 of GN R. 985 (as amended by GN R. 325) must be amended to include the correct footprint to be cleared for this proposed facility.
c) The EIAr must provide an assessment of the impacts and mitigation measures for each of the listed activities applied for.
d) The listed activities in the EIAr and the application form must be the same and correct.
e) Further note that, if Activity 14 of GN R. 983, as amended, is triggered, an amended application form for environmental authorisation must be submitted with the draft EIAr.
f) The EIAr must provide the technical details for the proposed facility in a table format as well as their description and/or dimensions.
g) The EIAr must provide the four corner coordinate points for the proposed development site (note that if the site has numerous bend points, at each bend point coordinates must be provided) as well as the start, middle and end point of all linear activities.
h) The EIAr must provide the following:
   - Clear indication of the envisioned area for the proposed wind energy facility; i.e. placing of wind turbines and all associated infrastructure should be mapped at an appropriate scale.
   - Clear description of all associated infrastructure. This description must include, but not limited to the following:
     - Power lines;
     - Internal roads infrastructure;
     - All supporting onsite infrastructure such as laydown area, guard house and control room etc.
     - All necessary details regarding all possible locations and sizes of the proposed satellite substation and the main substation.
i) Under legal requirements and guidelines, please ensure to consider the National or Provincial Ridge policy as the proposed facility will infringe or will take place on ridges.
j) The EIAr must also include a comments and response report in accordance with Appendix 2 h (iii) of the EIA Regulations, 2014 as amended.

k) A comments and Response trail report (C&R) must be submitted with the draft and the final EIAr. The C&R report must be a separate document from the main report and the format must be in the table format. It must clearly indicate the name of the Stakeholder, Date of comments, Comments and EAPs response.

l) Please note that you must refrain from summarising comments made by registered Interested and Affected Parties (I&APs) and an original comment from I&APs must be attached within all reports.

m) The EIAr must include the detail inclusive of the Public Participation Process in accordance with Regulation 41 of the EIA Regulations.

n) Details of the future plans for the site and infrastructure after decommissioning in 20 - 30 years and the possibility of upgrading the proposed infrastructure to more advanced technologies.

o) It is vital that, the relevant authorities are continuously involved throughout the EIAr process as the development property possibly falls within geographically designated areas in terms of GN R. 985, as amended. In addition, a graphical representation of the proposed development within the respective geographical areas must be provided.

p) Please note that you must in terms of Appendix 2 (2) (1) (e) of the EIA Regulations 2014, as amended, considers the National Environmental Management Biodiversity Act (NEMBA), 2004 (Act No. 10 of 2004) since the final SR indicates that there are Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs") on site.

q) The ecological assessment must take into consideration and use comments from the DENC, SKA and BirdLife SA during the EIAr process.

r) The South African Astronomy Observatory, SKA and BirdLife SA must be thoroughly engaged and their comments included as part of the EIAr.

s) The Bat and Avifaunal specialist assessments must assess and make recommendations for definite measurements for the preferred hub heights and rotor diameter.

t) It is indicated in the final SC report that the Avifauna assessment and the Bird and Bat Monitoring will form part of the draft EIAr to be submitted. Please note that the 12 months Bird and Bat Monitoring must be conducted in terms of the latest guidelines. Further note that the Bird and Bat Monitoring to be submitted as part of the EIAr must always include the updated requirements for 12 months Bird and Bat Monitoring. A copy of the latest guidelines can be found on the BirdLife South Africa's and SABAAP's website.

u) It is further noted that the following studies are not considered for the proposed development: Freshwater Ecology and Geohydrology Impact Assessment. A detailed motivation is required for not considering such studies and must be included in the draft EIAr or alternatively these two studies must also be undertaken as part of the EIAr.

v) The final EIAr must include information on services required on the site such as sewage, refuse removal, water and electricity. Who will supply these services and has an agreement and confirmation of capacity been obtained? Proof of these agreements must be provided.

w) It is noted that a detailed description of the need and desirability of the proposed development is included in the final SR. Please note that the need and desirability to be submitted with the EIAr must also indicate if the proposed development is needed in the region; if the current proposed location is desirable for the proposed activity compared to other sites, and must take into account cumulative impacts of the proposed development in the area.

x) Since there are other similar facilities within a 30km radius of the proposed development site, all specialist studies in the PoSEIA which are incorporated as part of the SR must also assess the facility in terms of potential cumulative impacts. The cumulative impact assessment for all identified and assessed impacts must indicate the following:

- Identified cumulative impacts must be clearly defined, and where possible the size of the identified impact must be quantified and indicated, i.e. hectares of cumulatively transformed land.
- Detailed process flow and proof must be provided, to indicate how the specialist's recommendations, mitigation measures and conclusions from the various developments in the area were taken into consideration in the assessment of cumulative impacts and when the conclusion and mitigation measures were drafted for this project.

- Identified cumulative impacts associated with the proposed development must be rated with the significance rating methodology approved with the acceptance of the scoping report.
- The cumulative impact significance rating must also inform the need and desirability of the proposed development.
- A cumulative impact environmental statement on whether the proposed development must proceed.

y) Please note that information on location of renewable energy developments can be accessed from https://www.environment.gov.za/mapsgraphics.

z) A copy of the preliminary site layout map inclusive of the coordinates of the facility in Degree, Minutes and Seconds (DDMMSS). All available biodiversity information must be used in the finalisation of the layout map. Existing infrastructure must be used as far as possible e.g. roads. The preliminary layout map must indicate the following:
- Wind turbine positions and its associated infrastructure;
- Permanent laydown area footprint;
- Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible);
- Wetlands, drainage lines, rivers, stream and water crossing of roads and cables indicating the type of bridging structures that will be used;
- The location of sensitive environmental features on site e.g. CBAs, heritage sites, wetlands, drainage lines etc. that will be affected by the facility and its associated infrastructure;
- Substation(s) and/or transformer(s) sites including their entire footprint;
- Connection routes (including pylon positions) to the distribution/transmission network;
- All existing infrastructure on the site, especially roads;
- Buffer areas;
- Buildings, including accommodation; and
- All "no-go" areas.

aa) An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.

bb) A map combining the final layout map superimposed (overlain) on the environmental sensitivity map.

cc) A shapefile of the preferred development layout/footprint must be submitted to this Department. The shapefile must be created using the Hartebeesthoek 94 Datum and the data should be in Decimal Degree Format using the WGS 84 Spheroid. The shapefile must include at a minimum the following extensions i.e. .shp; .shx; .dbf; .prj; and, .xml (Metadata file). If specific symbology was assigned to the file, then the .avl and/or the .lyr file must also be included. Data must be mapped at a scale of 1:10 000 (please specify if an alternative scale was used). The metadata must include a description of the base data used for digitizing. The shapefile must be submitted in a zip file using the EIA application reference number as the title. The shape file must be submitted to:

Postal Address:	Department of Environmental Affairs Private Bag X447 Pretoria 0001
Physical address:	Environment House 473 Steve Biko Road Pretoria
For Attention:	Muhammad Essop Integrated Environmental Authorisations Strategic Infrastructure Developments

Telephone Number: (012) 399 9406
Email Address: MEssop@environment.gov.za

dd) The Environmental Management Programme (EMPr) to be submitted as part of the EIAr must include the following:

- All recommendations and mitigation measures recorded in the EIAr and the specialist studies conducted.
- A final site layout map with clear legend.
- Measures as dictated by the final site layout map and micro-siting.
- An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.
- A map combining the final layout map superimposed (overlain) on the environmental sensitivity map.
- An alien invasive management plan to be implemented during construction and operation of the facility. The plan must include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken.
- A plant rescue and protection plan which allows for the maximum transplant of conservation important species from areas to be transformed. This plan must be compiled by a vegetation specialist familiar with the site and be implemented prior to commencement of the construction phase.
- A post construction avifaunal monitoring plan to be implemented during the operational phase of the facility. This plan must be compiled by an avifaunal specialist familiar with the site and the plan must adhere to Birdlife's most recent avifaunal guideline.
- A re-vegetation and habitat rehabilitation plan to be implemented during the construction and operation of the facility. Restoration must be undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.
- An open space management plan to be implemented during the construction and operation of the facility.
- A traffic management plan for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted. This plan must include measures to minimize impacts on local commuters e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time and avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations.
- A transportation plan for the transport of components, main assembly cranes and other large pieces of equipment.
- A storm water management plan to be implemented during the construction and operation of the facility. The plan must ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan must include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of storm water run-off.
- A fire management plan to be implemented during the construction and operation of the facility.
- An erosion management plan for monitoring and rehabilitating erosion events associated with the facility. Appropriate erosion mitigation must form part of this plan to prevent and reduce the risk of any potential erosion.
- 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 the possibility of oil and other toxic liquids from entering the soil or storm water systems.

- Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants.
- Measures to protect archaeological sites, artefacts, paleontological fossils or graves from construction and operational impacts.

The EAP must provide detailed motivation if any of the above requirements is not required by the proposed development and not included in the EMPr.

Please ensure that all the relevant Listing Notice activities are applied for, that the Listing Notice activities applied for are specific and that they can be linked to the development activity or infrastructure in the project description.

You are hereby reminded that should the EIAr fail to comply with the requirements of this acceptance letter, the proposed WEF development will be refused in terms of the EIA Regulations 2014, as amended.

The applicant is hereby reminded to comply with the requirements of Regulation 45 with regard to the time period allowed for complying with the requirements of the Regulations, and Regulations 43 and 44 with regard to the allowance of a comment period for interested and affected parties on all reports submitted to the competent authority for decision-making. The reports referred to are listed in Regulation 43 (1).

Furthermore, it must be reiterated that, should an application for Environmental Authorisation be subject to the provisions of Chapter II, Section 38 of the National Heritage Resources Act, Act 25 of 1999, then this Department will not be able to make nor issue a decision in terms of your application for Environmental Authorisation pending a letter from the pertinent heritage authority categorically stating that the application fulfils the requirements of the relevant heritage resources authority as described in Chapter II, Section 38(8) of the National Heritage Resources Act, Act 25 of 1999. Comments from SAHRA and/or the provincial department of heritage must be provided in the EIAr.

You are requested to submit an electronic copy (in the form of a USB) and one (1) hard copy (colour) of the EIAr to the Department. Please note that you are reminded to comply with Regulation 23(1) of the EIA Regulations, 2014, as amended.

Please also find attached information that must be used in the preparation of the EIAr. This will enable the Department to speedily review the EIAr and make a decision on the application.

You are hereby reminded of Section 24F of the National Environmental Management Act, Act No 107 of 1998, as amended, which stipulates that no activity may commence prior to an Environmental Authorisation being granted by the Department.

Yours faithfully

Mr Sabelo Malaza
Chief Director: Integrated Environmental Authorisations
Department of Environmental Affairs
Letter Signed by: Mr Danie Smit
Designation: Deputy Director: Integrated Environmental Authorisations
Date: 29/01/2019

cc:	Dr Kilian Hagemann	Rondekop Wind Farm (Pty) Ltd	Email: rondekop@g7energies.com

A. EIA INFORMATION REQUIRED FOR WIND ENERGY FACILITIES

1. General site information

The following general site information is required:

- Descriptions of all affected farm portions
- 21 digit Surveyor General codes of all affected farm portions
- Copies of deeds of all affected farm portions
- Photos of areas that give a visual perspective of all parts of the site
- Photographs from sensitive visual receptors (tourism routes, tourism facilities, etc.)
- Facility design specifications including:
  - Type of technology
  - Structure height
  - Surface area to be covered (including associated infrastructure such as roads)
  - Structure orientation
  - Laydown area dimensions (construction period and thereafter)
  - Generation capacity
- Generation capacity of the facility as a whole at delivery points

This information must be indicated on the first page of the EIAr. It is also advised that it be double checked as there are too many mistakes in the applications that have been received that take too much time from authorities to correct.

2. Sample of technical details for the proposed facility:

Component	Description/ Dimensions
Location of the site	
Facility area	
SG Codes	
Site access	
Export capacity	
Proposed technology	
Hub height from ground level	
Rotor diameter	
Area occupied by substations	
Area occupied by both permanent and construction laydown areas	
Area occupied by buildings	
Width and length of internal roads	
Proximity to grid connection	
Type and height of fencing	

3. Site maps and GIS information

Site maps and GIS information should include at least the following:

- All maps/information layers must also be provided in ESRI Shapefile format
- All affected farm portions must be indicated
- The exact site of the application must be indicated (the areas that will be occupied by the application)
- A status quo map/layer must be provided that includes the following:

- Current use of land on the site including:
  - Buildings and other structures
  - Agricultural fields
  - Grazing areas
  - Natural vegetation areas (natural veld not cultivated for the preceding 10 years) with an indication of the vegetation quality as well as fine scale mapping in respect of Critical Biodiversity Areas and Ecological Support Areas
  - Critically endangered and endangered vegetation areas that occur on the site
  - Bare areas which may be susceptible to soil erosion
  - Cultural historical sites and elements
- Rivers, streams and water courses
- Ridgelines and 20m continuous contours with height references in the GIS database
- Fountains, boreholes, dams (in-stream as well as off-stream) and reservoirs
- High potential agricultural areas as defined by the Department of Agriculture, Forestry and Fisheries
- Buffer zones (also where it is dictated by elements outside the site):
  - 500m from any irrigated agricultural land
  - 1km from residential areas
- Indicate isolated residential, tourism facilities on or within 1km of the site

- A slope analysis map/layer that include the following slope ranges:
  - Less than 8% slope (preferred areas for WIND TURBINE and infrastructure)
  - between 8% and 12% slope (potentially sensitive to WIND TURBINE and infrastructure)
  - between 12%and 14% slope (highly sensitive to WIND TURBINE and infrastructure)
  - steeper than 18 % slope (unsuitable for WIND TURBINE and infrastructure)
- A site development proposal map(s)/layer(s) that indicate:
  - Foundation footprint
  - Permanent laydown area footprint
  - Construction period laydown footprint
  - Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible)
  - River, stream and water crossing of roads and cables indicating the type of bridging structures that will be used
  - Substation(s) and/or transformer(s) sites including their entire footprint.
  - Cable routes and trench dimensions (where they are not along internal roads)
  - Connection routes to the distribution/transmission network (the connection must form part of the EIA even if the construction and maintenance thereof will be done by another entity such as ESKOM)
  - Cut and fill areas at WIND TURBINE sites along roads and at substation/transformer sites indicating the expected volume of each cut and fill
  - Borrow pits
  - Spoil heaps (temporary for topsoil and subsoil and permanently for excess material)
  - Buildings including accommodation

With the above information authorities will be able to assess the strategic and site impacts of the application.

4. Regional map and GIS information

The regional map and GIS information should include at least the following:

- All maps/information layers must also be provided in ESRI Shapefile format
- The map/layer must cover an area of 20km around the site
- Indicate the following:
  - roads including their types (tarred or gravel) and category (national, provincial, local or private)
  - Railway lines and stations
  - Industrial areas
  - Harbours and airports
  - Electricity transmission and distribution lines and substations
  - Pipelines
  - Waters sources to be utilised during the construction and operational phases
  - A visibility assessment of the areas from where the facility will be visible
  - Critical Biodiversity Areas and Ecological Support Areas
  - Critically Endangered and Endangered vegetation areas
  - Agricultural fields
  - Irrigated areas
  - An indication of new road or changes and upgrades that must be done to existing roads in order to get equipment onto the site including cut and fill areas and crossings of rivers and streams.

5. Important stakeholders

Amongst other important stakeholders, comments from the National Department of Agriculture, Forestry and Fisheries must be obtained and submitted to the Department. Any application, documentation, notification etc. should be forwarded to the following officials:

Ms Mashudu Marubini
Delegate of the Minister (Act 70 of 1970)
E-mail: MashuduMa@daff.gov.za
Tel 012- 319 7619

Ms Thoko Buthelezi
AgriLand Liaison office
E-mail: ThokoB@daff.gov.za
Tel 012- 319 7634

All hardcopy applications / documentation should be forwarded to the following address:

Physical address:	Delpen Building Cnr Annie Botha and Union Street Office 270
Attention:	Delegate of the Minister Act 70 of 1970
Postal Address:	Department of Agriculture, Forestry and Fisheries Private Bag X120 Pretoria 0001
Attention:	Delegate of the Minister Act 70 of 1970

In addition, comments must be requested from Eskom regarding grid connectivity and capacity. Request for comment must be submitted to:

Mr John Geeringh
Eskom Transmission
Megawatt Park D1Y38
PO Box 1091
JOHANNESBURG
2000

Tel: 011 516 7233
Fax: 086 661 4064
John.geeringh@eskom.co.za

B. AGRICULTURE STUDY REQUIREMENTS

- Detailed soil assessment of the site in question, incorporating a radius of 50 m surrounding the site, on a scale of 1:10 000 or finer. The soil assessment should include the following:
  - Identification of the soil forms present on site
  - The size of the area where a particular soil form is found
  - GPS readings of soil survey points
  - The depth of the soil at each survey point
  - Soil colour
  - Limiting factors
  - Clay content
  - Slope of the site
  - A detailed map indicating the locality of the soil forms within the specified area,
  - Size of the site
- Exact locality of the site
- Current activities on the site, developments, buildings
- Surrounding developments / land uses and activities in a radius of 500 m of the site
- Access routes and the condition thereof
- Current status of the land (including erosion, vegetation and a degradation assessment)
- Possible land use options for the site
- Water availability, source and quality (if available)
- Detailed descriptions of why agriculture should or should not be the land use of choice
- Impact of the change of land use on the surrounding area
- A shape file containing the soil forms and relevant attribute data as depicted on the map.

C. ASTRONOMY GEOGRAPHIC ADVANTAGE ACT, 2007 (ACT NO. 21 OF 2007)

The purpose of the Act is to preserve the geographic advantage areas that attract investment in astronomy. The entire Northern Cape Province excluding the Sol Plaatjie Municipality had been declared an astronomy advantage area. The Northern Cape optical and radio telescope sites were declared core astronomy advantage areas. The Act allowed for the declaration of the Southern Africa Large Telescope (SALT), MeerKAT and Square Kilometre Array (SKA) as astronomy and related scientific endeavours that had to be protected.

You are requested to indicate the applicability of the Astronomy Geographic Advantage Act, Act No. 21 of 2007 on the application in the BAR/EIR. You must obtain comments from the Southern African Large Telescope (SALT) if the proposed development is situated within a declared astronomy advantage area.

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X 447· PRETORIA · 0001· Environment House · 473 Steve Biko Road, Arcadia · PRETORIA

DEA Reference: 14/12/16/3/3/2/1115
Enquiries: Azrah Essop
Tel: 012 399 8529 **E-mail:** AEssop@environment.gov.za

Andrea Gibb
Sivest Environmental
P.O Box 2921
RIVONIA
2128

Tel: 011 798 0600
Email: andreag@sivest.co.za

PER EMAIL / MAIL

Dear Sir/Madam

ACKNOWLEDGEMENT OF RECEIPT OF THE DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) AND AMENDED APPLICATION FORM FOR THE PROPOSED 325MW RONDEKOP WIND ENERGY FACILITY BETWEEN MATJIESFONTAIN AND SUTHERLAND IN THE NORTHERN CAPE PROVINCE.

The Department confirms having received the draft Environmental Impact Assessment Report (EIAR) and amended application form for the abovementioned project on 20 March 2019. We further confirm that you have submitted these documents to comply with the Environmental Impact Assessment (EIA) Regulations, 2014, as amended.

Note that in terms of Regulation 45 of the EIA Regulations, 2014, as amended, this application will lapse if the applicant fails to meet any of the time-frames prescribed in terms of these Regulations, unless an extension has been granted by the Department in terms of Regulation 3(7) of the EIA Regulations, 2014, as amended.

All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Office Hours which is visible on the Departmental gate.
EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted.

You are hereby reminded of Section 24F of the National Environmental Management Act (NEMA), (Act No. 107 of 1998), as amended, that no activity may commence prior to an Environmental Authorisation being granted by the Department.

Kindly quote the abovementioned reference number in any future correspondence in respect of the application.

Yours sincerely

Mr Sabelo Malaza
Chief Director: Integrated Environmental Authorisations
Department of Environmental Affairs
Letter signed by: Mrs Azrah Essop
Designation: Environmental Officer Specialized Production: EIA Coordination, Strategic Planning and Support
Date: 20/03/2019

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

SiVEST
Environmental

51 Wessel Road, Rivonia
PO Box 2921, Rivonia
2128
Gauteng, South Africa

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Established 1952

Department of Environmental Affairs
Environment House
473 Steve Biko
Arcadia
PRETORIA
0083

DEA Reference: **14/12/16/3/3/2/1115**

Our reference: 15260

Date: 20 March 2019

ATTENTION: Constance Musemburi

Dear Constance Musemburi,

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) FOR THE PROPOSED DEVELOPMENT OF THE 325MW RONDEKOP WIND ENERGY FACILITY BETWEEN MATJIESFONTEIN AND SUTHERLAND IN THE NORTHERN CAPE PROVINCE

- **DEA Ref No: 14/12/16/3/3/2/1115**

SiVEST is in the process of undertaking the Environmental Impact Assessment (EIA) process for the proposed development of the above-mentioned Wind Energy Facility (WEF) in the Northern Cape Province.

We would like to take this opportunity to inform you that the Draft Environmental Impact Assessment Report (DEIAr) for the above-mentioned proposed development has been compiled, taking into consideration the issues and concerns raised by Interested and/or Affected Parties (I&APs), Organs of State / Authorities, Landowners and Stakeholders. Included is the updated application form, and the accompanying appendices, for the proposed development. Appended to this letter, is a table addressing the DEA content requirements for this DEIAr.

As such, please find herewith is one (1) hard copy and one (1) electronic copy (on USB) of the DEIAr and application form for the above-mentioned proposed development, as well as two (2) hard copies of the application form.

Please do not hesitate to contact us should you have any queries in this regard.

Andrea Gibb
PO BOX 2921, Rivonia, 2128
Tel – (011) 798 0600
Fax – (011) 803 7272
Email – andreag@sivest.co.za

Yours sincerely,

Andrea Gibb
Divisional Manager
SiVEST Environmental Division

Encl: 1 x Hard copy of the DEIAr (Incl. Appendices)
2 x Hard copies of the Application Form (Incl. Appendices)
1 x Electronic copy (on USB) of the DEIAr (Incl. Appendices), Application Form (Incl. Appendices) and shapefiles of the Preferred Layout

Table 1: Content Requirements for DEIAr

Content Requirements	Applicable Section
details of- the EAP who prepared the report; and the expertise of the EAP, including a *curriculum vitae;*	Details of the EAP and full project team are included **i**n Error! Reference source not found. in **Section** Error! Reference source not found.. The expertise (including curriculum vitae) of the EAP and full project team are including in **Appendix 2**.
the location of the development footprint of the activity on the approved site as contemplated in the accepted scoping report, including- the 21-digit Surveyor General code of each cadastral land parcel; where available, the physical address and farm name; where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	The location (including 21 digit Surveyor General codes) of the proposed project is detailed on page *iii* of the report, as well as in **section** Error! Reference source not found. on page **Error! Bookmark not defined.**
a plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is- a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	A map of the regional locality is shown in **section** Error! Reference source not found. on page **Error! Bookmark not defined.**, and the site locality is shown in section **Error! Reference source not found.** on page **Error! Bookmark not defined.**. Additionally, all project maps are included in **Appendix 5**. Coordinates are shown on page *iii* of the report, as well as in **section** Error! Reference source not found. on page **Error! Bookmark not defined.**. Additionally, all coordinates are included in **Appendix 8A**.
a description of the scope of the proposed activity, including- all listed and specified activities triggered; a description of the associated structures and infrastructure related to the development;	The listed and specified activities triggered as per NEMA are detailed in **Section** Error! Reference source not found. Error! Reference source not found. on page **Error! Bookmark not defined.**. The technical project description is included in **section** Error! Reference source not found. on page **Error! Bookmark not defined.**. This includes a description of activities to be undertaken, including associated structures and infrastructure.
a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;	A description of all legal requirements and guidelines is provided in Section **Error! Reference source not found.**: Error! Reference source not found. in **Section** Error! Bookmark not defined. **and Section** Error! Reference source not found.**:** Error! Reference source

Content Requirements	Applicable Section
	not found. on page **Error! Bookmark not defined.**. This includes key legal and administrative requirements as well as key development strategies and guidelines.
a motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted scoping report;	The need and desirability of the proposed project is discussed in **section** Error! Reference source not found. on page **Error! Bookmark not defined.**.
motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report;	The motivation for the preferred development footprint of the proposed project is discussed in **section** Error! Reference source not found. on page **Error! Bookmark not defined.**.
a full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including: details of the development footprint alternatives considered; details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them; the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts— can be reversed; may cause irreplaceable loss of resources; and can be avoided, managed or mitigated; the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;	A description of the alternatives considered in terms of the Regulations is included in **section** Error! Reference source not found. on page **Error! Bookmark not defined.**. An assessment of layout alternatives is included in **section 9**. The public participation process followed is detailed in **section 8**. Additionally, all public participation documents are included in **Appendix 7**. This includes a summary of issues raised by I&AP's, and the responses to their comments. A full description of the environmental attributes within the application site is included in **section** Error! Reference source not found.. The impacts, risks and mitigation associated with each alternative are assessed in **section** Error! Reference source not found.. The methodology used in identifying the impacts and risks associated with each alternative is included in **section** Error! Reference source not found.. The positive and negative impacts, along with the proposed mitigation measures related to the proposed activity will have on the environment are discussed in **section** Error! Reference source not found.. The outcome of the site selection matrix is included in **section** Error! Reference source not found.. A concluding statement indicating the preferred alternatives is contained in **sections** Error! Reference source not found. and Error! Reference source not found.

Content Requirements	Applicable Section
positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; the possible mitigation measures that could be applied and level of residual risk; if no alternative development footprints for the activity were investigated, the motivation for not considering such; and; a concluding statement indicating the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report;	
a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including— a description of all environmental issues and risks that were identified during the environmental impact assessment process; and; an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	The process undertaken to assess the impacts as well as the assessment of impacts by each specialist are shown in **Section 6.1.** Each environmental issue and risk are tabulated in **section 6.2** and an assessment of the significance of each issue before and after mitigation measures is included.
an assessment of each identified potentially significant impact and risk, including— cumulative impacts; the nature, significance and consequences of the impact and risk; the extent and duration of the impact and risk; the probability of the impact and risk occurring; the degree to which the impact and risk can be reversed; the degree to which the impact and risk may cause irreplaceable loss of resources; and the degree to which the impact and risk can be mitigated	The impact rating system contained in **Section 6.1.2** details the methodology for determining the significance of an impact. This includes the points (j) (i to vii) of **Appendix 3.** The assessment of each risk identified by the specialists is contained in **Section 6.2**.
where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to	All relevant specialist findings are included in **Section 5**, with all recommended mitigation measures detailed in **Section 6**. The mitigation measures have been

Content Requirements	Applicable Section
how these findings and recommendations have been included in the final assessment report;	incorporated into the EMPr which is contained in **Appendix 8**. The tabulated summary of key specialist findings and recommendations is included in **Section** Error! Reference source not found. and in the executive summary.
an environmental impact statement which contains— a summary of the key findings of the environmental impact assessment: a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	The summary of key findings are found in **Section** Error! Reference source not found.**.** The high quality maps showing the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers can be found in **Appendix 5.** The summary of the positive and negative impacts and risks of the proposed activity and identified alternatives can be found in **section** Error! Reference source not found..
based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	The recommended mitigation measures associated with each impact are included in **section 8**, and overall specialist recommendations and mitigation measures are included in **Section 6 and 7**. These measures are contained in the EMPr which can be found in **Appendix 8.**
the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	The final proposed alternatives are included in **Section 10**, including a comparative assessment by the specialists.
any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Any aspects identified by specialists or the EAP that should be included as conditions of the authorisation are identified in **Section 13** and in the executive summary.
a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	All assumptions and limitations are highlighted in **Section** Error! Reference source not found.**.**
a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	A reasoned opinion as to whether the proposed activity should be authorised, and, any conditions that should be made in respect of that authorisation can be found in **Section 15** and in the executive summary.
where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the	The period required for the environmental authorisation, as well as the date on which the activity and post construction monitoring will be concluded is addressed in **Section** Error! Reference source not found..

Content Requirements	Applicable Section
activity will be concluded and the post construction monitoring requirements finalised;	
an undertaking under oath or affirmation by the EAP in relation to the correctness of the information provided in the reports; the inclusion of comments and inputs from stakeholders and I&APs; the inclusion of inputs and recommendations from the specialist reports where relevant; and any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	The EAP affirmation is included in **Appendix 3**.
where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	If applicable, details of any financial provisions for the management of negative environmental impacts are included in **Section 12, Section 13** and the executive summary.
an indication of any deviation from the approved scoping report, including the plan of study, including– any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and a motivation for the deviation;	Indication and motivations of deviations can be found in **Section** Error! Reference source not found. and **Error! Reference source not found.**
any specific information that may be required by the competent authority; and	Noted. As part of the letter of acceptance for the FSR the DEA detailed specific information requirements. These requirements are tabulated in **Section 1.3,** along with an explanation of how the requirements are met. All correspondence from the DEA is included in **Appendix 4**.
any other matters required in terms of section 24(4)(a) and (b) of the Act.	Noted. All requirements in terms of section 24(4)(a) and (b) of the Act have been met in this report.

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X 447· PRETORIA · 0001· Environment House · 473 Steve Biko Road, Arcadia, PRETORIA

DEA Reference: 14/12/16/3/3/2/1115
Enquiries: Mr Vincent Chauke
Telephone: (012) 399 9399 **E-mail:** VChauke@environment.gov.za

Ms Andrea Gibb
SiVEST SA (Pty) Ltd.
P.O. Box 2921
REVONIA
2128

Telephone Number: (011) 798 0638
Email Address: andreag@sivest.co.za

PER E-MAIL / MAIL

Dear Ms Gibb

COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED CONSTRUCTION OF THE 325MW RONDEKOP WIND ENERGY FACILITY BETWEEN MATJIESFONTEIN AND SUTHERLAND, WITHIN THA KAROO HOOGLAND LOCAL MUNICIPALITY IN THE NORTHERN CAPE PROVINCE.

The draft Environmental Impact Assessment report (EIAr) dated 20 March 2019 and the amended application form for environmental authorisation (EA) received by this Department on 20 March 2019, refers.

<u>After reviewing the above-mentioned report and the application form for environmental authorisation, this Department has the following comments:</u>

i. Please ensure that all relevant listed activities are applied for, are specific and can be linked to the development activity or infrastructure as described in the project description.
ii. Please ensure that activities applied for in the application form for EA must be the same as those mentioned in the report. If the activities applied for in the application form for EA differ from those mentioned in the draft EIAr, an amended application form must be submitted with the final EIAr.
iii. Please ensure that all issues raised and comments received during the circulation of the draft EIAr from registered I&APs and organs of state which have jurisdiction (including this Department's Biodiversity Conservation Section, Northern Cape Department of Nature Conservation (DENC)) in respect of the proposed activity are adequately addressed in the final EIAr. Proof of correspondence with the various stakeholders must be included in the final EIAr. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments.
iv. The Public Participation Process must be conducted in terms of Regulation 39, 40 41, 42, 43 and 44 of the EIA Regulations 2014, as amended.
v. A Comments and Response trail report (C&R) must be submitted with the final EIAr. The C&R report must incorporate all historical comments for this development. The C&R report must be a separate document from the main report and the format must be in the table format. Please do not summarising comments made by I&APs. All comments from I&APs must be copied verbatim and responded to clearly. Please note that a response such as **"noted"** is not regarded as an adequate response to I&AP's comments.
vi. You are also reminded that the final EIAr must comply with all the requirements in the comments issued by the Department for the draft Scoping Report (SR), the conditions of the acceptance of the SR signed 21 January 2019 as well as the comments of this letter must be complied with.

vii. Please ensure that the final EIAr includes the undertaking under oath or affirmation by the EAP that is required in terms of Appendix 3 of GN R. 982.

viii. Specialist declaration of interest and a summary curriculum vitae of the specialists must also be included in the final EIAr.

ix. Recommendations provided by specialist reports must be considered and used to inform the final preferred Layout Plan and the EMPr.

x. The EMPr must indicate the time periods within which the impact management actions will be implemented in terms of Appendix 4 (j) of the EIA Regulations, 2014, as amended.

xi. Appendix 4 (m) (ii) requires that an environmental awareness plan must describe the manner in which risk must be dealt with in order to avoid pollution or the degradation of the environment. Please note that the EMPr to be submitted as part of the final EIAr must comply with all the requirements of Appendix 4 of the EIA Regulations, 2014, as amended.

xii. The preferred layout plan with the preferred substation, service routes, existing roads and new roads, and construction camp must be indicated in the final EIAr. A map combining the final layout plan superimposed (overlain) on the environmental sensitivity map must also be included in the final EIAr.

xiii. A copy of the preferred site layout map to be submitted with the final EIAr must also include the following:

- Permanent laydown area footprint;
- Internal roads indicating width (construction period **width** and **operation period width**) and with numbered sections between the other site elements which they serve (to make commenting on sections possible);
- Wetlands, drainage lines, rivers, stream and water crossing of roads and cables indicating the type of bridging structures that will be used;
- The location of sensitive environmental features on site e.g. CBAs, heritage sites, wetlands, drainage lines etc. that will be affected by the facility and its associated infrastructure;
- Substation(s) and/or transformer(s) sites including their entire footprint;
- Connection routes to the distribution/transmission network;
- All existing infrastructure on the site, especially roads;
- Buffer areas;
- Buildings inclusive of guard house and control room; and
- All "no-go" areas.

xiv. Please ensure that all hardcopy and softcopy maps are clear and legible. Hardcopy maps must be at least A3 size.

xv. You are further reminded that the final EIAr to be submitted to this Department must comply with all the requirements in terms of the scope of assessment and content of the EIAr in accordance with Appendix 3 of the EIA Regulations, 2014 as amended.

xvi. Further note that in terms of Regulation 45 of the EIA Regulations 2014 as amended, this application will lapse if the applicant fails to meet any of the timeframes prescribed in terms of these Regulations, unless an extension has been granted in terms of Regulation 3(7).

The EAP is requested to contact the Department to make the necessary arrangements to conduct a site visit prior to the submission of the final EIAr.

You are hereby reminded that should the final report fail to comply with the requirements of this letter, the proposed 325MW Rondekop Wind Energy Facility will be refused in terms of the EIA Regulations 2014, as amended.

You are further reminded of Section 24F of the National Environmental Management Act, Act No 107 of 1998, as amended, that no activity may commence prior to an environmental authorisation being granted by the Department.

Yours faithfully

Mr Sabelo Malaza
Chief Director: Integrated Environmental Authorisations
Department of Environmental Affairs
Signed by: Mr Danie Smit
Designation: Deputy Director: National Infrastructure Projects
Date: 17/04/2019.

cc:	Dr Kilian Hagemann	Rondekop Wind Farm (Pty) Ltd	Email: rondekop@g7energies.com

Stephan Jacobs

From:	Stephan Jacobs	
Sent:	Tuesday, 23 April 2019 1:10 PM	
To:	Vincent Chauke	
Cc:	Andrea Gibb; Liandra Scott-Shaw; 'Veronique Fyfe'; Karen de Bruyn; Nyiko Nkosi	
Subject:	Rondekop WEF: 14/12/16/3/3/2/1115 - Confirmation of proposed DEA Site Visit	
Importance:	High	
Tracking:	**Recipient**	**Delivery**
	Vincent Chauke	
	Andrea Gibb	Delivered: 2019/04/23 1:10 PM
	Liandra Scott-Shaw	Delivered: 2019/04/23 1:10 PM
	'Veronique Fyfe'	
	Karen de Bruyn	
	Nyiko Nkosi	

Good Afternoon Vincent,

Our earlier telephonic discussion regarding the site visit for the Rondekop Wind Energy Facility (WEF) near Sutherland in the Northern Cape Province (14/12/16/3/3/2/1115) which was requested by your Department refers.

As confirmed during our earlier discussion, we agree with the approach of submitting the Final Environmental Impact Assessment Report (FEIAr) to the Department before the site visit is undertaken (as suggested by Nyiko). The client has indicated that they would prefer this approach too. **If we could please obtain confirmation (in writing) from your Department that this approach is acceptable that would be greatly appreciated.**

We are also in agreement with the dates proposed for the site visit, namely the week of 27-31 May 2019. I have spoken to the client regarding the proposed dates and they are happy with the dates proposed. **Please can you provide the exact dates during this week for when you would like to undertake the site visit so that we can make the necessary arrangements. Once you have confirmed the exact dates I will send out a meeting invitation to all attendees in order to confirm.**

It must be noted that you would most likely require two (2) days for this site visit as it takes approximately 4 hours to drive to Sutherland from Cape Town. I would thus suggest the following approach for the site visit:

- Day 1 = Travel to Sutherland from Cape Town.
- Day 2 = undertake site visit (starting in the morning) and travel back to Cape Town in afternoon following site visit.

Please indicate whether you are in agreement with the approach mentioned above or whether you have any other suggestions.

Please could you also extend this invitation to your Biodiversity Conservation Department, should they wish to attend this site visit too. We will send them an email informing them about the proposed site visit with your Department and that you will be in contact with them in order to discuss this further.

Please do not hesitate to contact us should there be any issues or should you have any queries.

Kind Regards,

Stephan Jacobs ***(B.Sc. (Hons) Environmental Management and Analysis)***
Environmental Consultant / Visual Specialist

SiVEST Environmental Division

SiVEST is a Level 3 BBBEE Contributor

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Appendix 5

Maps

Appendix 6

Specialist Studies

Appendix 6A

Agricultural and Soils Assessment

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Addendum to:

AGRICULTURAL AND SOILS IMPACT ASSESSMENT FOR THE PROPOSED 325MW RONDEKOP WIND ENERGY FACILITY, (WEF) BETWEEN MATJIESFONTEIN AND SUTHERLAND IN THE NORTHERN CAPE PROVINCE (DEA REF: 14/12/16/3/3/2/1115)

The purpose of this addendum is:

1. To assess whether the proposed changes to the project description and layout have any impact on the findings of the above Agricultural and Soils Impact Assessment, dated 31 October 2018.
2. To respond to DEA's received comment on the above Agricultural and Soils Impact Assessment, dated 31 October 2018.

1 Assessment of the proposed changes to the project description and layout

1. The change in the turbine capacity from **between 3MW and 6.5MW** to be **up to 8MW** will have no effect on the findings of the above Agricultural and Soils Impact Assessment, dated 31 October 2018.
2. The overall impact rating reflected in the above Agricultural and Soils Impact Assessment, dated 31 October 2018, is not affected by the following proposed changes:
   - All turbines are still valid (slight alignment shifts mainly to turbine 16 [ecology changes] 44 [to avoid the 200m bat and bird buffer surrounding the watercourse]).
   - Turbine 25 access road to crane pad: minor alignment change as the current alignment was very close to the edge of the ridge and ecologist was concerned about downslope erosion).
   - Turbine 27 access road: minor alignment shift to avoid crossing a rocky ridge / outcrop as per the ecology requirement.
   - Road between turbine 28 & 29: minor alignment change to avoid rocky outcrop.
   - Crane pad 29 & 35: minor alignment change to avoid the rocky outcrops.
   - Access road north 1: shifted the alignment slightly away from the drainage line and then crossing it perpendicularly at a single point.
   - Access road 2: shifted to only cross the drainage line at one point.
   - Construction Camp 1: shift to follow road alignment.

2 Response to DEA's comments on the above Agricultural and Soils Impact Assessment, dated 31 October 2018

DEA has commented on the above Agricultural Impact Study by cutting and pasting their standardised requirements for an agricultural study. The need to fulfill these requirements has already been addressed in the submitted agriculture study, as the following excerpts from the report show:

Section 2. The terms of reference for the study fulfills the requirements for a soils and agricultural study as described in the National Department of Agriculture's document, *Regulations for the evaluation and review of applications pertaining to renewable energy on agricultural land*, dated September 2011. The study applies an appropriate level of detail for the agricultural suitability and soil variation on site, which, because it is justified (see section 3.1), is less than the standardised level of detail stipulated in the above regulations.

Note: DEA's requirements for an agricultural study are taken directly from this document but use an older version of the document and not the most recent version, which was updated in 2011.

Section 3.1. The area in which the development is proposed is of extremely low land capability and severely limited by climatic moisture availability. It is also within a REDZ where assessment has already been done as part of the SEA for the REDZ. A field investigation was not therefore considered necessary.

The level of soil mapping detail in the above DAFF requirements (see Section 2) is appropriate for arable land only. It is not appropriate for this site. Detailed soil mapping has little relevance to an assessment of agricultural potential in this environment, where the agricultural limitations are overwhelmingly climatic, soil conditions are generally poor, and cultivation potential is non-existent. In such an environment, even where soils suitable for cultivation may occur, they cannot be cultivated because of the aridity constraints. Conducting a soil assessment at the stipulated level of detail would be very time consuming and would add absolutely no value to the assessment.

The level of assessment used is considered entirely adequate for a thorough assessment of all the agricultural impacts of the proposed development.

As the above shows, DEA's standardised requirements for an agricultural study are inappropriate for the site of the proposed Rondekop Wind Energy Facility and have not therefore been adhered to in the Agricultural and Soils Impact Assessment. The study has nevertheless thoroughly assessed all the agricultural impacts of the proposed development.

Johann Lanz
26 February 2019

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AGRICULTURAL AND SOILS IMPACT ASSESSMENT FOR PROPOSED RONDEKOP WIND ENERGY FACILIY PROJECT BETWEEN MATJIESFONTEIN AND SUTHERLAND, NORTHERN CAPE

EIA REPORT

Report by
Johann Lanz

31 October 2018

Johann Lanz
Professional profile

Education

• M.Sc. (Environmental Geochemistry)	University of Cape Town	1996 - June 1997
• B.Sc. Agriculture (Soil Science, Chemistry)	University of Stellenbosch	1992 - 1995
• BA (English, Environmental & Geographical Science)	University of Cape Town	1989 - 1991
• Matric Exemption	Wynberg Boy's High School	1983

Professional work experience

I am registered as a Professional Natural Scientist (Pri.Sci.Nat.) in the field of soil science, registration number 400268/12, and am a member of the Soil Science Society of South Africa.

- **Soil Science Consultant** **Self employed** **2002 - present**

  I run a soil science consulting business, servicing clients in both the environmental and agricultural industries. Typical consulting projects involve:
- Soil specialist study inputs to EIA's, SEA's and EMPR's. These have focused on impact assessments and rehabilitation on agricultural land, rehabilitation and re-vegetation of mining and industrially disturbed and contaminated soils, as well as more general aspects of soil resource management. Recent clients include: CSIR; SRK Consulting; Aurecon; Mainstream Renewable Power; SiVEST; Savannah Environmental; Subsolar; Red Cap Investments; MBB Consulting Engineers; Enviroworks; Sharples Environmental Services; Haw & Inglis; BioTherm Energy; Tiptrans.
- Soil resource evaluations and mapping for agricultural land use planning and management. Recent clients include: Cederberg Wines; Unit for Technical Assistance - Western Cape Department of Agriculture; Wedderwill Estate; Goedgedacht Olives; Zewenwacht Wine Estate, Lourensford Fruit Company; Kaarsten Boerdery; Thelema Mountain Vineyards; Rudera Wines; Flagstone Wines; Solms Delta Wines; Dornier Wines.
- I have conducted several recent research projects focused on conservation farming, soil health and carbon sequestration.
- I have project managed the development of soil nutrition software for Farmsecure Agri Science.

- **Soil Science Consultant** **Agricultural Consultors International (Tinie du Preez)** **1998 - end 2001**

  Responsible for providing all aspects of a soil science technical consulting service directly to clients in the wine, fruit and environmental industries all over South Africa, and in Chile, South America.

- **Contracting Soil Scientist** **De Beers Namaqualand Mines** **July 1997 - Jan 1998**

  Completed a contract to make recommendations on soil rehabilitation and re-vegetation of mined areas.

Publications

- Lanz, J. 2012. Soil health: sustaining Stellenbosch's roots. In: M Swilling, B Sebitosi & R Loots (eds). *Sustainable Stellenbosch: opening dialogues*. Stellenbosch: SunMedia.
- Lanz, J. 2010. Soil health indicators: physical and chemical. *South African Fruit Journal*, April / May 2010 issue.
- Lanz, J. 2009. Soil health constraints. *South African Fruit Journal*, August / September 2009 issue.
- Lanz, J. 2009. Soil carbon research. *AgriProbe*, Department of Agriculture.
- Lanz, J. 2005. Special Report: Soils and wine quality. *Wineland Magazine.*

I am a reviewing scientist for the *South African Journal of Plant and Soil*.

Specialist Declaration

I, Johann Lanz, as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- I act as the independent specialist in this application;
- I perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have no vested interest in the proposed activity proceeding;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Name of company: Johann Lanz – Soil Scientist

Professional Registration (including number): SACNASP Reg. no. 400268/12

Date: 31 October 2018

EXECUTIVE SUMMARY

The proposed development will be located on land zoned and used for agriculture (namely grazing). South Africa has very limited arable land and it is therefore critical to ensure that development does not lead to an inappropriate loss of potentially arable land. This assessment has found that the proposed development will only impact agricultural land which is of extremely low agricultural potential and which is only suitable for low intensity grazing.

The key findings of this study are:

- The proposed project area is dominated by rock outcrop and very shallow soils on underlying rock and hardpan carbonate. Dominant soil forms are Mispah, Glenrosa and Oakleaf.
- The major limitations to agriculture are the limited climatic moisture availability (low rainfall), the rugged terrain and the shallow, rocky soils
- As a result of these limitations, the agricultural use of the study area is limited to low intensity grazing only.
- The proposed project area is classified with land capability evaluation values predominantly between 2 and 5, which is very low to low.
- The significance of all agricultural impacts is kept low by three important factors:
    - The actual footprint of disturbance of the wind farm constitutes only a very small proportion of the available land;
    - The land has extremely limited agricultural potential; and
    - The footprint will be concentrated on those parts of the landscape that are least suited to any agricultural use.
- Two potential negative impacts of the development on agricultural resources and productivity were identified. These are:
    - Soil erosion and degradation; and
    - Cumulative, regional loss of agricultural land.
- One potential positive impact of the development on agricultural resources and productivity was identified as:
    - Generation of additional land use income from wind farm, which will improve cash flow and financial sustainability of farming enterprises on site.
- All impacts were assessed as having **low significance after mitigation** (or if mitigation is not required).
- The recommended mitigation measure is for implementation of an effective system of storm water run-off control.
- There is no material difference between the significance of impacts of any of the proposed alternatives. **All proposed alternatives have equally low impact**.
- Due to the low agricultural potential of the site, and the consequent low, negative agricultural impact, there are no restrictions relating to agriculture which preclude authorisation of the proposed development (including all alternatives) and therefore, from an agricultural impact point of view, the development should be authorised.

Environmental parameter	Issues	Rating prior to mitigation	Average	Rating post mitigation	Average
Soil	Erosion & degradation	24	24	11	11
			Low Negative Impact		Low Negative Impact

Table of Contents

1 INTRODUCTION

Rondekop Wind Farm (Pty) Ltd are proposing the development of the Rondekop Wind Energy Facility (WEF) approximately 45 kilometres south-west of the town of Sutherland in the Northern Cape Province (see Figure 1).

The proposed facility is located partially within the Komsberg Renewable Energy Development Zone (REDZ 2), one of the eight REDZ formally gazetted[1] in South Africa indicating the procedure to be followed in applying for environmental authorisation (EA) for large scale solar and wind energy generation facilities. Considering that a portion of the proposed facility is located outside of the Komsberg REDZ, the Rondekop WEF will be subject to a full Environmental Impact Assessment (EIA) process in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA) as amended and EIA Regulations, 2014 (as amended). As such an Agricultural Impact Assessment is required for the proposed development. Johann Lanz was appointed by SiVEST SA (Pty) Ltd as an independent specialist to conduct this Agricultural Impact Assessment.

The facility will have an energy generation capacity of up to 325 megawatt (MW), with the normal associated WEF infrastructure which will include, but not limited to, up to 48 turbines, hard standing areas for cranes, roads, cabling, buildings, and temporary lay down areas for construction.

The objectives of this study are to identify and assess all potential impacts of the proposed development on agricultural resources, including soils, and agricultural production potential and to provide recommended mitigation measures, monitoring requirements, and rehabilitation guidelines for all identified impacts.

2 PROJECT DESCRIPTION

The facility will have an energy generation capacity of up to 325 megawatt (MW), with the normal associated WEF infrastructure which will include up to 48 turbines. The generated electricity will be fed into the national distribution network via a 132kV power line which is the subject of a separate Environmental Authorisation (EA) application which will be submitted on behalf of Rondekop Wind Farm.

The proposed Rondekop WEF is to be developed on three separate ridges and will include the following components, as shown in Figure 1 below.

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1 Formally gazetted on 16 February 2018 (government notice 114).

- Up to 48 wind turbines with a generation capacity of between 3MW and 6.5MW each with a maximum total generation capacity of 325MW, depending on the total developable area.
- Turbines with a hub height of between 90 m and up to 140 m and a rotor diameter of between 100 m and up to 180m.
- Permanent compacted hardstanding laydown areas (also known as crane pads) for each wind turbine of 4 500m^2 (90 m x 50) per turbine.
- Electrical transformers (690V/33kV) adjacent to each turbine (typical footprint of 2 m x 2 m, but can be up to 10 m x 10 m at certain locations) to step up the voltage to 33kV.
- Underground 33kV cabling between turbines buried along access roads, where feasible, with overhead 33kV lines crossing valleys and ridges outside of the road footprints to connect to the onsite 33/132kV substation.
- Internal access roads up to 12 m wide, including structures for stormwater control, to provide access to each turbine and the substation, with a total footprint of about 73 ha. 38,6 ha will be upgrades to existing roads. Turns will have a radius of up to 50 m in order for abnormal loads (especially turbine blades) to access the various turbine positions.
- Access roads to the site will be approximately 9 m wide while access roads to the substation will be approximately 6 m wide.
- A new 33/132kV onsite substation with a total footprint of approximately 2.25ha.
- Up to 4 (the height will be the same as the final wind turbine hub height) wind measuring lattice masts strategically placed within the wind farm development footprint to collect data on wind conditions during the operational phase. The height of these masts will be the same as the turbine hub height.
- Temporary infrastructure including:
  - a construction camp (~13ha) and on-site concrete batching plant for use during the construction phase, and
  - offices, administration, operations and maintenance buildings during the operational phase.
- Fencing (up to 6m in height) around the construction camp and batching plant.
- Temporary infrastructure to obtain water from available local sources/ new or existing boreholes including:
  - a potential temporary above ground pipeline (approximately 35cm diameter) to feed water to the on-site batching plant, and
  - water storage tanks.
- Application site ~37 543.13 hectares (cadastral units). The total footprint of the wind farm will however be ~ 114 ha (of which ~38ha will be upgrading of existing roads).

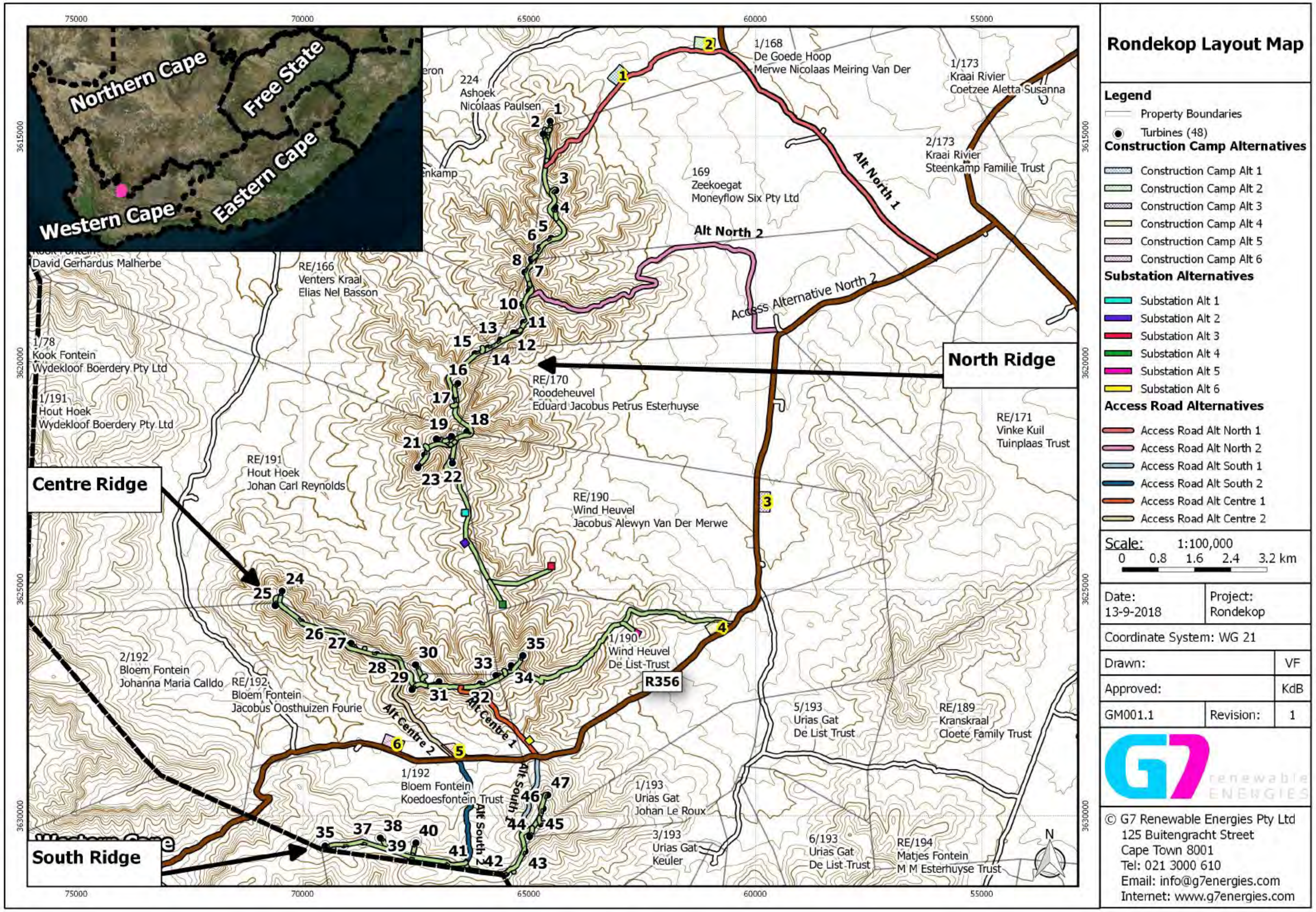

Figure 1. *Proposed layout of the Rondekop WEF and associated infrastructure showing the site locality.*

3 TERMS OF REFERENCE

The following terms of reference apply to this study:

General requirements:

- Adherence to the content requirements for specialist reports in accordance with Appendix 6 of the EIA Regulations 2014, as amended;
- Adherence to all appropriate best practice guidelines, relevant legislation and authority requirements;
- Provide a thorough overview of all applicable legislation, guidelines
- Cumulative impact identification and assessment as a result of other renewable energy (RE) developments in the area (including; a cumulative environmental impact table(s) and statement, review of the specialist reports undertaken for other Renewable Energy developments and an indication of how the recommendations, mitigation measures and conclusion of the studies have been considered);
- Identification sensitive areas to be avoided (including providing shapefiles/kmls);
- Assessment of the significance of the proposed development during the Pre-construction, Construction, Operation, Decommissioning Phases and Cumulative impacts. Potential impacts should be rated in terms of the direct, indirect and cumulative:
    - Direct impacts are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.
    - Indirect impacts of an activity are indirect or induced changes that may occur as a result of 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 as a result of the activity.
    - Cumulative impacts are 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. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.
- Comparative assessment of alternatives;
- Recommend mitigation measures in order to minimise the impact of the proposed development; and
- Implications of specialist findings for the proposed development (e.g. permits, licenses etc).

Specific requirements:

- Describe the existing environment in terms of soils, geology, land-use and agricultural potential. Significant soils and agricultural features or disturbances should be identified, as well as sensitive features and receptors within the project area. The description must include surrounding agricultural land uses and activities, to convey the local agricultural context.
- Describe and map soil types (soil forms), soil characteristics (soil depth, soil colour,

limiting factors, and clay content of the top and sub soil layers), and degradation and erodibility of soils etc. to the extent necessary to inform this assessment.

- Varying sensitivities of the soils and agricultural potential must be mapped and highlighted.
- The assessment is to be based on existing information, and professional experience and field work conducted by the specialist, as considered necessary and in accordance with relevant legislated requirements.
- Identify and assess the potential impacts of the proposed development on soils and agriculture, including impacts of associated infrastructure, such as the buildings, fencing etc and provide relevant mitigation measures to include in the environmental management plan.
- Identify any protocols, legal and permit requirements relating to soil and agricultural potential impacts that are relevant to this project and the implications thereof.
- Map sensitivity of the site and clearly show no-go areas i.e. existing irrigated fields/ cultivated lands
- The report needs to fulfil the terms of reference for an agricultural study as set out in the National Department of Agriculture's document, Regulations for the evaluation and review of applications pertaining to renewable energy on agricultural land, dated September 2011, with an appropriate level of detail for the agricultural suitability and soil variation on site (which may therefore be less than the standardised level of detail stipulated in the above regulations).

The report also fulfils the requirements of Appendix 6 of the 2014 EIA Regulations (as amended) - See Table 1.

Table 1. Compliance with the Appendix 6 of the 2014 EIA Regulations (as Amended)

Requirements of Appendix 6 – GN R326 EIA Regulations 7 April 2017	**Addressed in the Specialist Report**
(1) A specialist report prepared in terms of these Regulations must contain- (a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Title pagepage ii
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	page iv
(c) an indication of the scope of, and the purpose for which, the report was prepared;	Sections 1 & 3
(cA)an indication of the quality and age of base data used for the specialist report;	Section 4.1
(cB)a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Sections 7.5, 7.6 & 8.3
(δ) the date, duration and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 4.1
(ε) a description of the methodology adopted in preparing the report or	Section 4

	carrying out the specialised process inclusive of equipment and modelling used;	
(ϕ)	details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 7.7 & Figure 1
(γ)	an identification of any areas to be avoided, including buffers;	Section 7.7
(η)	a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Figure 1
(ι)	a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 5
(φ)	a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 8
(κ)	any mitigation measures for inclusion in the EMPr;	Section 8
(λ)	any conditions for inclusion in the environmental authorisation;	Section 9
(μ)	any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Not applicable
(ν) (i)	a reasoned opinion- whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities and (ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	 Section 9 Section 9 Section 8
(ο)	a description of any consultation process that was undertaken during the course of preparing the specialist report;	Not applicable
(π)	a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	**N/A** -No feedback has yet been received from the public participation process regarding the agricultural environment
(θ)	any other information requested by the competent authority.	**N/A**. No information regarding the agricultural study has been requested from the competent authority to date.
(2)	Where a government notice *gazetted* by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	**N/A**

4 METHODOLOGY OF STUDY

4.1 Methodology for assessing soils and agricultural potential

The area in which the development is proposed is of extremely low land capability and severely limited by climatic moisture availability. It is also partially within a REDZ where assessment has already been done as part of the SEA for the REDZ. A field investigation was not therefore considered necessary. The assessment was based on a desktop analysis of existing soil and agricultural potential data and other data for the site.

The potential impacts identified in this specialist study were assessed based on the criteria and methodology common to the whole impact assessment. The ratings of impacts were based on the specialist's knowledge and experience of the field conditions of the environment in which the proposed development is located, and of the impact of disturbances on that agricultural environment.

The following sources of information were used:

- Soil data was sourced from the land type data set, of the Department of Agriculture, Forestry and Fisheries. This data set originates from the land type survey that was conducted from the 1970's until 2002. It is the most reliable and comprehensive national database of soil information in South Africa and although the data was collected some time ago, it is still entirely relevant as the soil characteristics included in the land type data do not change within time scales of hundreds of years.
- Land capability data was sourced from the 2017 National land capability evaluation raster data layer produced by the Department of Agriculture, Forestry and Fisheries, Pretoria.
- Rainfall and temperature data was sourced from The World Bank Climate Change Knowledge Portal, dated 2015.
- Grazing capacity data was sourced from Cape Farm Mapper.
- Satellite imagery of the site and surrounds was sourced from Google Earth.
- The Strategic Environmental Assessment for wind and solar photovoltaic development in South Africa (DEA, 2015) was also consulted in terms of its sensitivity analysis of the area.

It is my opinion that the level of soil mapping detail in the above DAFF requirements (see Section 2) is appropriate for arable land only. It is not appropriate for this site. Detailed soil mapping has little relevance to an assessment of agricultural potential in this environment, where the agricultural limitations are overwhelmingly climatic, terrain is rugged, soil conditions are generally poor, and cultivation potential is non-existent. In such an environment, even where soils suitable for cultivation may occur, they cannot be cultivated because of the aridity and terrain constraints. Conducting a soil assessment at the stipulated level of detail would be very time consuming and be a waste of that time, as it would add no value to the assessment.

The level of assessment used is considered entirely adequate for a thorough assessment of all the agricultural impacts of the proposed development.

4.2 Methodology for determining impact significance

All potential impacts were assessed in terms of the following criteria:

GEOGRAPHICAL EXTENT This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of

		resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
CUMULATIVE EFFECT This describes the cumulative effect of the impacts on the environmental parameter. A cumulative effect/impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects
3	Medium Cumulative impact	The impact would result in minor cumulative effects
4	High Cumulative Impact	The impact would result in significant cumulative effects
INTENSITY Describes the severity of an impact		
1	Low	Impact affects the quality, use and integrity of the

		system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

SIGNIFICANCE Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:

(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

The summation of the different criteria will produce a non weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	**Impact Significance Rating**	**Description**
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate

		mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.
74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

5 ASSUMPTIONS, CONSTRAINTS AND LIMITATIONS OF STUDY

The assessment rating of impacts is not an absolute measure. It is based on the subjective considerations and experience of the specialist, but is done with due regard and as accurately as possible within these constraints.

The study makes the assumption that water for irrigation is not available across the site. This is based on the assumption that a long history of farming experience in an area will result in the exploitation of viable water sources if they exist, and none have been exploited in this area.

Cumulative impacts are assessed by adding expected impacts from this proposed development to existing and proposed developments with similar impacts in a 50 km radius. The existing and proposed developments that were taken into consideration for cumulative impacts are listed in Appendix B. SiVEST undertook every effort to obtain the information (including specialist studies, BA / EIA / Scoping and EMPr Reports) for the surrounding developments. However, many of the documents are not currently publically available to download and could therefore not be reviewed during this assessment.

There are no other specific constraints, uncertainties and gaps in knowledge for this study.

6 APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

The Subdivision of Agricultural Land Act (Act 70 of 1970) (SALA), may require that an application for the proposed development be approved by the Department of Agriculture, Forestry and Fisheries (DAFF). DAFF reviews and approves this application according to their *Guidelines for the evaluation and review of applications pertaining to renewable energy on agricultural land*, dated September 2011. Rehabilitation after disturbance to agricultural land is managed by the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA). No application is required in terms of CARA. The EIA process covers the required aspects of this.

7 BASELINE ASSESSMENT OF THE SOILS AND AGRICULTURAL CAPABILITY OF THE AFFECTED ENVIRONMENT

This section is organised in sub headings based on the requirements of an agricultural study as detailed in section 2 of this report.

7.1 Climate and water availability

Rainfall for the site is given as a very low 125 mm per annum (The World Bank Climate Change Knowledge Portal, undated). The average monthly distribution of rainfall is shown in Figure 2. Rainfall and resultant moisture availability are entirely insufficient to support viable, rainfed cultivation of crops and it significantly limits the grazing capacity of the veld.

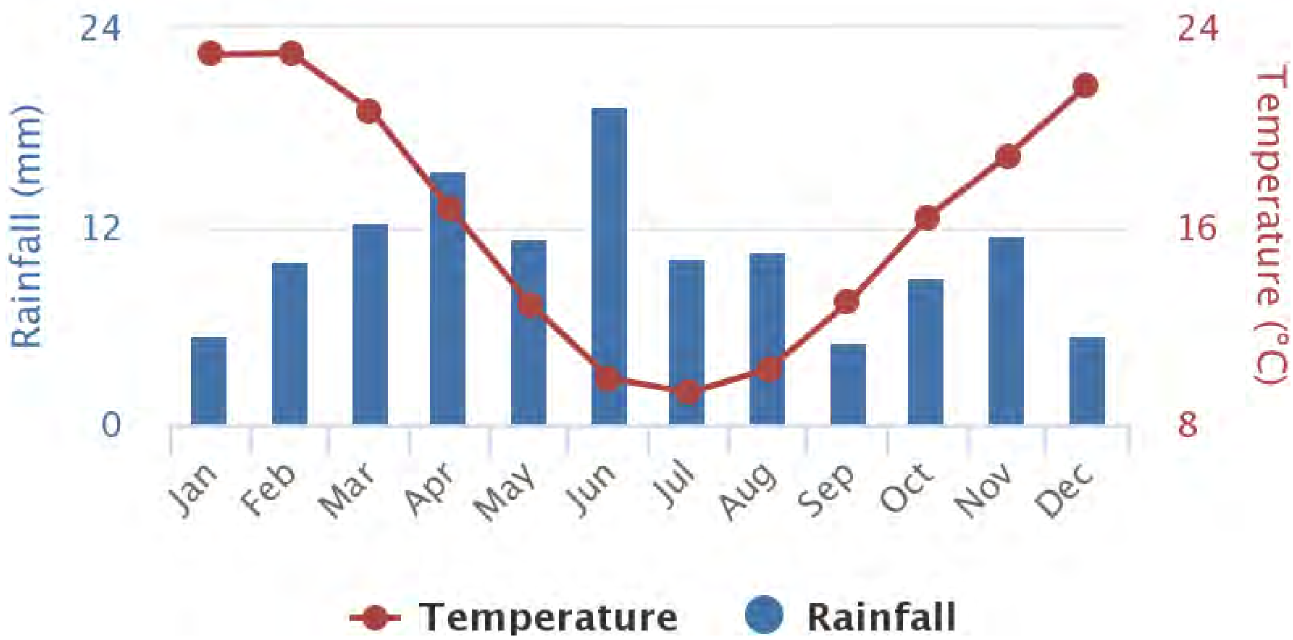

Figure 2. *Average monthly temperature and rainfall for location -32.74; 20.30, which is in the centre of the site (The World Bank Climate Change Knowledge Portal, 2015).*

7.2 Terrain, topography and drainage

The proposed WEF is located on three mountain ridges on an elevated plain. Altitude varies from a minimum of approximately 680 metres on the plain to the highest ridge at approximately 1 200 metres. There is a wide range of slopes across the mountains of the project area. There are several non-perennial water courses, typical of arid areas, across the project area.

The underlying geology is mudstone, siltstone, sandstone and shale of the Beaufort and Ecca

Groups of the Karoo Supergroup.

7.3 Soils

The land type classification is a nationwide survey that groups areas of similar soil, terrain and climatic conditions into different land types. There are five land types across the study area (see Figure 3). Most wind farm infrastructure is located on land type Fc269, with some infrastructure on Fc295, Fc300, and Fc274. Land type Ag93 also occurs in the study area, but no WEF infrastructure is proposed on this land type. Soils on all these land types are fairly similar and are predominantly shallow, sandy soils on underlying rock or hard-pan carbonate. Dominant soil forms are Mispah, Glenrosa and Oakleaf (which are deeper than the other soils). The soils would fall into the Lithic and Calcic soil groups according to the classification of Fey (2010). A summary detailing soil data for the land types is provided in Appendix 1, Table A1.

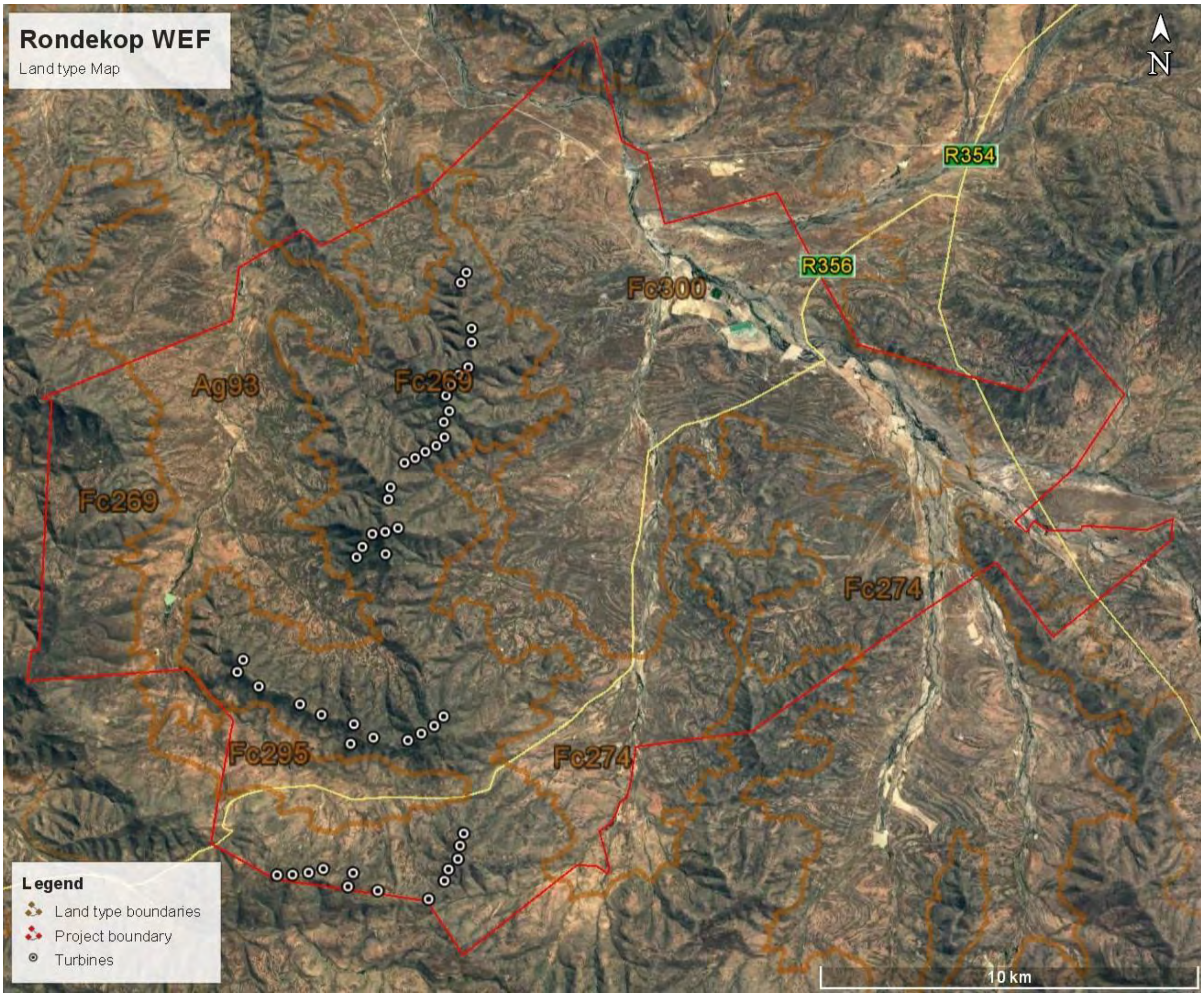

Figure 3. *Land types across the project area.*

7.4 Agricultural capability

Land capability is defined as the combination of soil, climate and terrain suitability factors for supporting rainfed agricultural production. It is an indication of what level and type of agricultural production can sustainably be achieved on any land. The higher land capability classes are suitable as arable land for the production of cultivated crops, while the lower suitability classes are only suitable as non-arable grazing land, or at the lowest extreme, not even suitable for grazing. In 2017 DAFF released updated and refined land capability mapping across the whole of South Africa. This has greatly improved the accuracy of the land capability rating for any particular piece of land anywhere in the country. The new land capability mapping divides land capability into 15 different categories with 1 being the lowest and 15 being the highest. Values of below 8 are generally not suitable for production of cultivated crops. Detail of this land capability scale is shown in Table 2.

The project area is classified with land capability evaluation values that range from 1 to 7, with the range between 2 and 5 covering the majority of the area. The land capability is limited by the very low climatic moisture availability, the rugged terrain, and the shallow, rocky soils.

Table 2: Details of the 2017 Land Capability classification for South Africa.

Land capability evaluation value	Description
1	Very Low
2	
3	Very Low to Low
4	
5	Low
6	Low to Moderate
7	
8	Moderate
9	Moderate to High
10	
11	High
12	High to Very High
13	
14	Very High
15	

Due to the land capability constraints, agricultural land use is restricted to low intensity grazing only. The natural grazing capacity is given on Cape Farm Mapper as low, at 45 to 55 hectares per large stock unit.

7.5 Land use and development on and surrounding the site

The WEF is located in a sheep farming agricultural region, and grazing on natural veld is by far the dominant land use, although some cultivation exists along the banks of the Tankwa River in the east of the site and to a lesser extent along the banks of one of its tributaries, the Houthoek River in the west of the site. There is very little agricultural infrastructure in the study area, apart from fencing into camps and wind pumps with stock watering points. There are very few farm buildings across the site.

7.6 Possible land use options for the site

Due to the extreme aridity constraints as well as the rugged terrain and poor soils, the land is considered unsuitable for agricultural purposes, other than low intensity grazing.

7.7 Agricultural sensitivity

Agricultural sensitivity is directly related to the capability of the land for agricultural production. This is because a negative impact on land of higher agricultural capability is more detrimental to agriculture than the same impact on land of low agricultural capability. A general assessment of agricultural sensitivity, in terms of loss of agricultural land in South Africa, considers arable land that can support viable production of cultivated crops, to have high sensitivity. This is because there is a scarcity of such land in South Africa, in terms of how much is required for food security. However, there is not a scarcity in the country of land that is only suitable as grazing land and such land is therefore not considered to have high agricultural sensitivity.

In terms of the sensitivity categories used in the REDZ sensitivity analysis, the southern parts of this site, that were included in that study, were assessed as low sensitivity (DEA, 2015).

Agricultural potential and conditions are very uniform across the site and the choice of placement of facility infrastructure, including access roads, and transmission lines therefore has minimal influence on the significance of agricultural impacts. No agriculturally sensitive areas occur within the study area. From an agricultural point of view, no parts of the site need to be avoided by the development and there are no required buffers.

8 IDENTIFICATION AND ASSESSMENT OF IMPACTS ON AGRICULTURE

The focus and defining question of an agricultural impact assessment is to determine to what extent a proposed development will compromise (negative impacts) or enhance (positive impacts) current and/or future agricultural production. The significance of an impact is therefore a direct function of the degree to which that impact will affect current or future agricultural production. Although the development may include impacts on the resident farming community, for example visual impacts, such lifestyle impacts do not necessarily impact agricultural production and are therefore not relevant to and within the scope of an agricultural impact assessment. Such impacts are better addressed within the impact assessments of other disciplines, as is being done through the EIA process.

The ways in which the project can impact on soils, agricultural resources and productivity are:

- Disturbance and changes to the land surface characteristics (particularly the establishment of roads), which may lead to erosion and land degradation.

The significance of all potential agricultural impacts is kept low by three important factors.

- The actual footprint of disturbance of the WEF (including associated infrastructure and roads) is very small in relation to the surface area of the affected farms. The WEF infrastructure will only occupy approximately 2% of the surface area, according to the typical surface area requirements of wind farms in South Africa (DEA, 2015). Therefore, the impact of erosion and degradation will not be widespread and can at worse only affect a very limited proportion of the surface area. All grazing will be able to continue unaffectedly across the farms.
- The proposed site is on land of extremely limited agricultural potential that is only viable for low intensity grazing. Grazing can continue in tandem with the WEF.
- The infrastructural footprint is likely to be concentrated on the crests of ridges, which are the rockiest parts of the landscape and the least suitable for any agricultural use.

The following impacts are identified for the different phases of the development and described in table format below.

8.1 Impacts that are associated with all 3 phases of the development – construction, operational and decommissioning

The following impact is relevant for all three phases of the development and the assessment is identical for all three phases.

IMPACT TABLE	
Environmental Parameter	Soil
Nature	Erosion and degradation resulting from disturbance and changes to the land surface and run-off characteristics, particularly due the use of roads and hard stands. Changes to the surface that lead to accumulation and channelling of run-off water can cause erosion. Because of the slopes, the aridity and the shallow soils, erosion risk is high.

Extent	Site
Probability	Probable / Possible
Reversibility	Partly reversible
Irreplaceable loss of resources	Marginal
Duration	Long term
Cumulative effect	Negligible
Intensity/magnitude	Medium / Low
Significance Rating	Low negative

	Pre-mitigation	**Post-mitigation**
Extent	1	1
Probability	3	2
Reversibility	2	2
Irreplaceable loss	2	2
Duration	3	3
Cumulative effect	1	1
Intensity	2	1
Significance rating	- 24 (low negative)	- 11 (low negative)

Mitigation measures:

- Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion.
- Any occurrences of erosion must be attended to immediately and the integrity of the erosion control system at that point must be amended to prevent further erosion from occurring there.

8.2 Impacts associated only with the operational phase of the development

The following impact occurs only during the operational phase.

IMPACT TABLE		
Environmental Parameter	farm economic sustainability	
Nature	Generation of additional land use income through rental to energy facility. This is a positive impact for agriculture. It will provide the farming enterprises on site with increased cash flow and rural livelihood, and thereby improve their financial sustainability.	
Extent	Site	
Probability	Definite	
Reversibility	Completely reversible	
Irreplaceable loss of resources	No loss	
Duration	Long term	
Cumulative effect	Negligible	
Intensity/magnitude	Low	
Significance Rating	Low positive	
	Pre-mitigation	**Post-mitigation**
Extent	1	n/a
Probability	4	n/a
Reversibility	1	n/a
Irreplaceable loss	1	n/a
Duration	3	n/a
Cumulative effect	1	n/a
Intensity	1	n/a
Significance rating	11 Low positive	n/a
Mitigation measures: None possible		

8.3 Cumulative impact

The cumulative impact of a development is the impact that development will have when its impact is considered together with the incremental impacts of other past, present or reasonably foreseeable future activities that will affect the same environment. The most important concept related to a cumulative impact is that of an acceptable level of change to an environment. A cumulative impact only becomes relevant when the sum of proposed developments that impact an environment will cause an acceptable level of change to be exceeded.

For formal assessment purposes, in terms of the NEMA regulations, cumulative impacts are assessed by taking all known, proposed, similar developments within a certain distance of the development being assessed, into account. Restricting the cumulative impacts to similar developments is entirely arbitrary (but perhaps administratively necessary), because all developments, regardless of their type and similarity, will contribute to exceeding an acceptable level of change, and therefore to cumulative impact.

The formal assessment of the cumulative impact of the Rondekop WEF has been assessed by consideration of all other renewable energy facilities located within a 50 km radius of the Rondekop WEF. There are 17 such projects, and these are listed in Appendix 2. The impacts identified for these projects and the mitigation measures proposed for them have been taken into account for this assessment and the mitigation it proposes.

All of these projects have the same impacts within a very similar agricultural environment, with the same agricultural potential, and mostly within the same Renewable Energy Development Zone (REDZ). The one solar project will have a greater proportional footprint on agricultural land than the wind farms, but it is a small project of only 10 MW. The potential cumulative impact is a regional loss or degradation of agricultural land. What is important in assessing this impact is that the cumulative impact is affecting an agricultural environment that has been declared a REDZ (or have the same agricultural potential as the adjacent REDZ) precisely because it is an environment that can accommodate numerous renewable energy developments without exceeding acceptable levels of agricultural land loss. This is primarily because of the low agricultural capability of land across the area, and the fact that such land is not a scarce resource in South Africa. It is far preferable to incur a cumulative loss of agricultural land in such a region, without cultivation potential, than to lose agricultural land that has a higher potential, to renewable energy development, elsewhere in the country.

Another important factor which renders the cumulative impact low, is the fact that the footprint of disturbance of wind farms is very small in relation to available land (approximately 2% of the total surface area – see above). Therefore, even if every single farm portion across the entire area (50km buffer) contained wind farms, the total cumulative footprint would never exceed 2% of the land surface, which would still be well below acceptable levels of change. The cumulative impact across the landscape is much lower because it is highly unlikely that every farm within the 50km buffer will ever contain a wind farm.

This environment could accommodate many more renewable energy projects than currently exist or than are proposed, before acceptable levels of change have any likelihood of being exceeded. Acceptable levels of change in terms of other areas of impact such as visual impact would be exceeded long before agricultural levels of change came anywhere near to being exceeded.

The cumulative impact is described in table format below.

IMPACT TABLE		
Environmental Parameter	agricultural land (grazing)	
Nature	Occupation of and impact to the land by the project infrastructure of multiple developments	
Extent	Local / district	
Probability	Probable / Possible	
Reversibility	Partly reversible	
Irreplaceable loss of resources	Marginal	
Duration	Long term	
Cumulative effect	Negligible	
Intensity/magnitude	Low	
Significance Rating	Low negative	
	Pre-mitigation	**Post-mitigation**
Extent	2	2
Probability	3	2
Reversibility	2	2
Irreplaceable loss	2	2
Duration	3	3
Cumulative effect	1	1
Intensity	1	1
Significance rating	13 Low negative	12 Low negative
Mitigation measures: There is no additional mitigation required for cumulative impacts, other than what has already been recommended for the project above.		

8.4 Assessment of project alternatives

No site location alternatives are considered because these have already been considered in a high-level screening of potential environmental and socio-economic issues, as well as 'fatal flaws' to determine suitable areas for project development.

The proposed alternatives are (see Figure 1):

8.5 Layout Alternatives

Turbine Layout Alternatives

One layout alternative will be assessed for Rondekop WEF based on 48 wind turbines with associated crane pad areas and other associated infrastructure. The proposed layout is spread over three ridges, namely northern ridge, centre ridge and southern ridge.

Road layout alternatives

Various access road alternatives are currently proposed to connect the R356 to the three ridges. The proposed access to the site is from the tarred R354 connecting Matjiesfontein and Sutherland, turning north-west onto R356 provincial gravel road and heading west from where the access roads branches off. The six access road alternatives (two per ridge) branch off the R356.

Considering that the proposed Rondekop WEF is to be developed on three separate ridges, there are two proposed access roads to each ridge, therefore six access road alternatives in total.

Three access road alternatives would connect the public R356 road to the new wind farm road network between the turbines on the ridges namely:

- *North ridge*

- Access road alternative North 1, route is approximately 11.8 km in length, almost all of which comprises an existing farm road that will need to be upgraded; or
- Access road alternative North 2 is approximately 12.8 km in length and branches off the R356 and follows an existing farm road that will need to be upgraded.

- *Centre ridge*

- Access road alternative Centre 1 is approximately 2.6 km in length and branches off the R356 to the north and connects between turbine 31 and 32; or
- Access road alternative Centre 2 is approximately 3.1 km in length and branches off the R356 and connects to the site near turbine 28.

- *Southern ridge*

- Access road alternative South 1 is approximately 1.9 km in length and branches off the R356 to the south and connects near turbine 45; or

- Access road alternative South 2 is approximately 4.2 km in length and branches off the R356 to the south and connects near turbine 42.

Each road section will be buffered by approximately 200 m to allow for incremental alternatives i.e. reroute within the buffer in order to avoid any sensitive features identified during the detailed specialist assessments.

Construction camps

Six alternative construction camp layouts, including the area required for a batching plant, will be assessed namely construction camp:

- Construction Camp Alternative 1 is located adjacent to Access Road Alternative North 1 on the Farm 224 Ashoek at the end of an existing farm road;
- Construction camp Alternative 2 is also located adjacent to Access Road Alternative North 1 on the Farm 224 Ashoek at the end of an existing farm road;
- Construction Camp Alternative 3 is located adjacent to and east of the R356 public road on the Remainder of farm 190 Wind Heuvel;
- Construction Camp Alternative 4 is located at the intersection of an existing 4x4 track and the R356 on portion 1 of farm 190 Wind Heuvel;
- Construction Camp Alternative 5, is located at the intersection of the R356, access road alternative centre 2 and access road alternative south 1 extending to the north on the remainder of farm 192 Bloem Fontein; and
- Construction Camp Alternative 6 is located to the west of access road alternative centre 2 north of the R356 on the remainder of farm 192 Bloem Fontein.

Substations

Six (6) onsite 33/132kV substation location alternatives were identified based on technical studies which considered aspects such as topography, earth works and levelling, environmentally sensitive features, electrical losses, turbine locations and existing agricultural use. All six (6) positions are located relatively in the centre of the facility.

- Substation alternative 1 is located south of turbine 22 on the remainder of farm 191 Hout Hoek;
- Substation alternative 2 is located south of substation alternative 1 on the remainder of farm 191 Hout Hoek;
- Substation alternative 3 is located south east of substation alternative 2 on the remainder of farm 190 Wind Heuvel;
- Substation alternative 4 is located north east of substation alternative 3 on the remainder of farm 190 Wind Heuvel;
- Substation alternative 5 is located west of construction camp alternative 4 along an existing 4x4 jeep track; and
- Substation alternative 6 is located adjacent to access road alternative center 1 to the east on portion 1 of farm 190 Wind Heuvel.

Because of the low agricultural impacts and the agricultural uniformity of the site, there is no material difference between the significance of impacts of any of the proposed alternatives. Therefore, from an agricultural impact perspective, there are no preferred alternatives, and all the proposed alternatives are acceptable.

Key

PREFERRED	The alternative will result in a low impact / reduce the impact / result in a positive impact
FAVOURABLE	The impact will be relatively insignificant
LEAST PREFERRED	The alternative will result in a high impact / increase the impact
NO PREFERENCE	The alternative will result in equal impacts

Alternative	Preference	Reasons (incl. potential issues)
ACCESS ROADS		
Alternative for northern ridge		
Access Road Alternative North 1	No Preference	Low agricultural impacts and the agricultural uniformity of the site.
Access Road Alternative North 2	No Preference	Low agricultural impacts and the agricultural uniformity of the site.
Alternative for center ridge		
Access Road Alternative Centre1	No Preference	Low agricultural impacts and the agricultural uniformity of the site.
Access Road Alternative Centre 2	No Preference	Low agricultural impacts and the agricultural uniformity of the site.
Alternative for southern ridge		
Access Road Alternative South 1	No Preference	Low agricultural impacts and the agricultural uniformity of the site.
Access Road Alternative South 2	No Preference	Low agricultural impacts and the agricultural uniformity of the site.
CONSTRUCTION CAMPS		
Construction Camp Alternative 1	No Preference	Low agricultural impacts and the agricultural uniformity of the site.
Construction Camp Alternative 2	No Preference	Low agricultural impacts and the agricultural uniformity of the site.
Construction Camp Alternative 3	No Preference	Low agricultural impacts and the agricultural uniformity of the site.
Construction Camp Alternative 4	No Preference	Low agricultural impacts and the agricultural uniformity of the site.
Construction Camp Alternative 5	No Preference	Low agricultural impacts and the agricultural uniformity of the site.
Construction Camp Alternative 6	No Preference	Low agricultural impacts and the agricultural uniformity of the site.
SUBSTATIONS		
Substation Alternative 1	No Preference	Low agricultural impacts and the

Alternative	Preference	Reasons (incl. potential issues)
		agricultural uniformity of the site.
Substation Alternative 2	No Preference	Low agricultural impacts and the agricultural uniformity of the site.
Substation Alternative 3	No Preference	Low agricultural impacts and the agricultural uniformity of the site.
Substation Alternative 4	No Preference	Low agricultural impacts and the agricultural uniformity of the site.
Substation Alternative 5	No Preference	Low agricultural impacts and the agricultural uniformity of the site.
Substation Alternative 6	No Preference	Low agricultural impacts and the agricultural uniformity of the site.

8.6 Assessment of the no-go alternative

The no-go alternative considers impacts that will occur to the agricultural environment in the absence of the proposed development. The one identified potential such impact is that due to climate variability and consequent low rainfall in the area, in addition to other economic and market pressures on farming, the agricultural enterprises will come under increased pressure in terms of economic viability.

Because of the low negative impact of the development of the WEF and its positive economic impact (also low significance), the development is assessed, from an agricultural impact perspective, as the preferred alternative over the no-go alternative.

The assessment of the impact of the no-go alternative is described in table format below.

IMPACT TABLE	
Environmental Parameter	agricultural land (grazing)
Nature	The one identified potential such impact is that due to climate variability and consequent low rainfall in the area, in addition to other economic and market pressures on farming, the agricultural enterprises will come under increased pressure in terms of economic viability.
Extent	Site
Probability	Possible
Reversibility	Partly reversible
Irreplaceable loss of resources	Marginal

Duration	Long term
Cumulative effect	Medium
Intensity/magnitude	Medium
Significance Rating	Low negative

	Pre-mitigation	Post-mitigation
Extent	1	n/a
Probability	2	n/a
Reversibility	2	n/a
Irreplaceable loss	2	n/a
Duration	3	n/a
Cumulative effect	3	n/a
Intensity	2	n/a
Significance rating	26 Low negative	n/a
Mitigation measures: It makes no sense to propose mitigation measures for the no-go alternative. Who would be responsible for implementing mitigation measures in the case of the no-go alternative?		

9 CONCLUSIONS

South Africa has very limited arable land and it is therefore critical to ensure that development does not lead to an inappropriate loss of potentially arable land. The assessment has found that the proposed development will only impact agricultural land which is of extremely low agricultural potential and only suitable for low intensity grazing.

All agricultural impacts of the proposed development are assessed as being of low significance. This is because of the limited agricultural potential of the proposed development site, which is a function of the climate, terrain and shallow soils and the fact that grazing can continue in tandem with the WEF. The fact that the footprint of disturbance of the wind farm is limited to a very small proportion of the surface area also limits the agricultural impact. The study area has low agricultural sensitivity because of its low potential. No parts of the site need to be excluded from the proposed development and no buffers are required.

This agricultural impact assessment is considered to be comprehensive and no further study is required for agricultural impact.

Due to the very low agricultural potential of the site, and the consequent very low agricultural impact, there are no restrictions relating to agriculture which preclude authorisation of the proposed development and therefore, from an agricultural impact point of view, the development should be authorised. There is no preference for all the WEF turbine locations and the associated infrastructure and all alternatives can be supported.

There are no conditions resulting from this assessment that need to be included in the Environmental Authorisation, apart from the mitigation measures proposed above.

10 REFERENCES

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The World Bank Climate Change Knowledge Portal available at http://sdwebx.worldbank.org/climateportal/

APPENDIX 1: SOIL DATA

Table A1. Land type soil data for the site. Land types are listed in decreasing order in terms of the proportion of the surface area of the site that they occupy.

Land type	Soil series (forms)	Depth (mm)	Clay % A horizon	Clay % B horizon	Depth limiting layer	% of land type
Fc269	Rock outcrop					36.6
	Glenrosa	100 - 150	6 - 15	10 - 20	so	27.8
	Mispah	50 - 100	6 - 15		R	23.4
	Oakleaf	300 > 1200	5 - 10	10 - 30	R,U,ca	6.2
	Valsrivier	100 - 200	5 - 15	35 - 55	vr,vp	3.6
	Hutton	50 - 250	0 - 5	5 - 25	R,so	0.9
	Swartland	100 - 150	6 - 15	35 - 55	vr,R	0.9
	Clovelly	300 > 1200	0 - 5	0 - 5	R	0.7
	Dundee	300 - 1200	0 - 5		R,U,ca	0.1
Fc295	Mispah	50 - 100	6 - 15		R	32.6
	Oakleaf	300 > 1200	5 - 10	10 - 30	R,U,ca	22.5
	Glenrosa	50 - 100	6 - 15	10 - 20	so	20.0
	Rock outcrop					7.8
	Valsrivier	150 - 200	10 - 15	35 - 55	vr	6.8
	Swartland	100 - 150	5 - 10	20 - 50	vr,R	6.5
	Hutton	200 - 400	2 - 5	10 - 30	R,so	3.4
	Oakleaf	300 > 1200	5 - 10	10 - 30	R,U,ca	0.4
	Dundee	500 > 1200	0 - 10		R,U,ca	0.3
Fc300	Oakleaf	300 > 1200	5 - 10	6 - 40	R,U,ca	45.4
	Hutton	50 - 350	2 - 5	10 - 25	R,db,ca	16.3
	Rock outcrop					13.0
	Swartland	100 - 150	5 - 10	20 - 50	vr,vp	12.5
	Mispah	50 - 150	6 - 15		R	5.7
	Glenrosa	50 - 100	6 - 15	10 - 20	so	5.5
	Oakleaf	300 > 1200	5 - 10	6 - 40	R,U,ca	1.1
	Dundee	500 > 1200	0 - 5		R,U,ca	0.5
	Valsrivier	100 - 250	10 - 15	20 - 50	vr,vp	0.2
Fc274	Rock outcrop					30.0
	Hutton	200 - 350	5 - 15	10 - 30	R,db	16.0

Land type	Soil series (forms)	Depth (mm)	Clay % A horizon	Clay % B horizon	Depth limiting layer	% of land type
	Oakleaf	300 > 1200	5 - 10	10 - 30	R,U,ca	13.5
	Glenrosa	100 - 150	6 - 15	10 - 20	so	13.1
	Swartland	100 - 150	5 - 15	20 - 55	vr,R	12.0
	Valsrivier	100 - 200	10 - 15	20 - 55	vr,vp	8.2
	Mispah	50 - 120	6 - 15		R,ka	7.0
	Dundee	500 > 1200	0 - 5		R,U,ca	0.3
Ag93	Hutton	50 - 300	0 - 5	10 - 30	R,so	43.9
	Oakleaf	300 > 1200	5 - 10	15 - 35	R,U,ca	25.9
	Glenrosa	50 - 100	6 - 15	10 - 20	R	14.2
	Mispah	50 - 100	6 - 15		R	7.4
	Rock outcrop					7.0
	Swartland	100 - 150	5 - 10	20 - 30	vr	0.7
	Dundee	600 > 1200	0 - 5		R,U,ca	0.5
	Oakleaf	300 > 1200	5 - 10	15 - 35	R,U,ca	0.4

Depth limiting layers: R = hard rock; so = partially weathered bedrock; lo = partially weathered bedrock (softer); ca = soft carbonate; ka = hardpan carbonate; db = dorbank hardpan; hp = cemented hardpan plinthite (laterite); sp = soft plinthic horizon; pr = dense, prismatic clay layer; vp = dense, structured clay layer; vr = dense, red, structured clay layer; gc = dense clay horizon that is frequently saturated; pd = podzol horizon; U = alluvium.

APPENDIX 2: PROJECTS CONSIDERED IN CUMULATIVE ASSESSMENT

Name	Megawatt	Status
Brandvalley WEF	140	Approved
Esizayo WEF	140	Approved
Gunstfontein WEF	200	Approved
Hidden Valley (Karusa & Soetwater) WEF	140 each	Preferred bidders. Construction to commence 2019
Hidden Valley (Greater Karoo) WEF	140	Approved
Kareebosch WEF	140	Approved
Komsberg West and East WEF	140 each	Approved
Kudusberg WEF	325	In process
Maralla WEF (East and West)	140 each	Approved
Perdekraal East WEF	110	Under Construction
Perdekraal West WEF	150	Approved
Rietkloof WEF	36	Approved
Roggeveld WEF	140	Preferred bidders. Construction to commence 2019
Sutherland WEF	140	Approved
Sutherland SEF	10	Approved
Tooverberg WEF	140	In process
Witberg WEF	120	Approved

Appendix 6B

Aquatic Ecology Assessment

Environmental and Scientific Assessment Services	Dr Brian Colloty Ecologist (Pr Sci Nat 400268/07) Member of the South African Wetland Society	
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1 March 2019

To whom it may concern

AQUATIC IMPACT ASSESSMENT FOR THE PROPOSED 325MW RONDEKOP WIND ENERGY FACILITY, (WEF) BETWEEN MATJIESFONTEIN AND SUTHERLAND IN THE NORTHERN CAPE PROVINCE (DEA REF: 14/12/16/3/3/2/1115)

With regard the Aquatic Impact Assessment submitted 25 October 2018 some layout changes have occurred, namely:

- The increase in turbine capacity from between 3MW and 8MW.
- All turbine positions were found acceptable in particular the changes to Turbine 16 [ecology changes] 44 [to avoid the 200m bat and bird buffer surrounding the watercourse]).
- Turbine 25 access road to crane pad: minor alignment change as the current alignment was very close to the edge of the ridge. The revised position will thus minimise the potential impact of erosion through avoidance of steep slopes.
- Turbine 27 access road: minor alignment shifts to avoid crossing a rocky ridge / outcrop as per the ecology requirement.
- Road between turbine 28 & 29: minor alignment changes to avoid rocky outcrop.
- Crane pad 29 & 35: minor alignment changes to avoid the rocky outcrops.
- Access road north 1: shifted the alignment slightly away from the drainage line and then crossing it perpendicularly at a single point. It is always advised that any water course crossing runs perpendicular to the direction of flow, is this results in a small structure, thus less impedance of flow.
- Access road 2: shifted to only cross the drainage line at one point.
- Construction Camp 1: shift to follow road alignment.

Based on the above a review of the proposed project changes was conducted and based on the current state of the aquatic environment, the potential impacts, it was determined that the following project description / layout and the following aspects would not alter the overall impact rating of LOW for all aquatic impacts post mitigation:

Lastly a comment was also received from the DEA on the Final Scoping Report, with regard the potential need for fish and invertebrate assessments as part of the aquatic assessment.

Based on the state and habitat type (ephemeral / flashy systems) rivers present on the RondeThus,Site, these upper catchment areas would not contain long term habitat that could support fish and invertebrates within the project footprint, i.e. suitable habitat is only found downstream, which isa significant distance from the facility. In summary, no permanent habitats suitable for the occurrence of fish and invertebrates were found within the development footprint. Additionally, coupled to this fact is that in the >100 renewable projects assessment undertaken by various specialist to date, which includes 17 projects in construction, no detrimental long-term impacts on the aquatic environment have been noted. Thus an assessment of aquatic invertebrates and fish is not conducted for these Karroo ecosystems.

Please don't hesitate to contact me should you require additional information

Yours Sincerely

Dr Brian Colloty
0834983299

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) FOR THE PROPOSED 325MW RONDEKOP WIND ENERGY FACILITY BETWEEN MATJIESFONTEIN AND SUTHERLAND IN THE NORTHERN CAPE PROVINCE

AQUATIC IMPACT ASSESSMENT

FOR

SiVEST SA (PTY) LTD

BY

EnviroSci (Pty) Ltd

Dr Brian Colloty

1 Rossini Rd
Pari Park
Port Elizabeth
6070

DATE

25 October 2018

REVISION 2

Executive Summary

SiVEST SA (Pty) Ltd appointed EnviroSci (Pty) Ltd to conduct an aquatic assessment of the proposed Rondekop Wind Energy Facility (WEF) located 45 km south-west of Sutherland in the Northern Cape Province. This included delineating any natural waterbodies on the properties in question, as well as assessing the potential consequences of the proposed layout on the surrounding watercourses. This was based on information collected during various site visits conducted within the region in late August 2012, July 2014 and March 2016, which coincided with early winter / winter rainfall within the region. A site-specific visit was conducted in early spring between the 25-28 September 2018. The survey adhered to the assessment criteria contained in the DWAF 2005 / 2008 delineation manuals and the National Wetland Classification System. This report will inform the Environmental Impact Assessment (EIA) process.

The proposed development occurs within the following catchments within the Nama Karoo ecoregion:

- E23B Windheuwel (Tankwa)
- E23C Houthoek (Tankwa)
- E23H Brak (Ongeluks)

The above-mentioned mainstem catchment systems located within the greater Tankwa, Brak or Ongeluks rivers catchments respectively are characterised by several perennial watercourses and drainage lines. and

Overall, these catchment and subsequent rivers / watercourses are largely in a natural state. Current impacts occur in localised areas and included the following:

- Erosion because of road crossings;
- Several farm dams; and
- Undersized culverts within present day road crossings.

Absent from the study area were the typical Juncus wetlands (valley bottom wetland types – with and without channels) with the closest natural wetland system being more than 3 km from the site boundary. Thus, the systems within the study area are alluvial river systems, characterised as natural sediment transport mechanisms within the regional environment. The lack of any natural wetlands (pans and or valley bottom systems) was also substantiated by the National Wetland Inventory v5.2 spatial data. One small seepage wetland was found during a follow-up walkdown, which coincided with some rainfall and later in the growth season. It was found in close proximity to **Centre Ridge Road Alternative 1, and for this reason this option should be avoided.**

In terms of the National Freshwater Ecosystems Priority Areas (NFEPA) assessment, all the watercourses within the site have been assigned a condition score of AB (Nel et al. 2011), indicating that they are largely intact and of biological significance. This is largely due to these catchments falling within the headwaters of the Ongeluks and Tankwa rivers. However, as the study area systems are mostly ephemeral, these don't support any wide riparian zones and the vegetation associated with these watercourses was between 0.5 m and 12 m wide. Species found within these catchments consisted mostly of *Searsia* species (*S. undulata, lancea & crenata*) and *Vachellia karroo*. Where broader river valleys occur, *Tamarix usenoides* and *Galenia africana* were observed, while in narrow areas in the higher lying watercourses, *Salix mucronata* were also noted.

The National Freshwater Ecosystems Priority Areas (NFEPA) (Nel *et al*., 2011), also earmarked sub-quaternaries, based either on the presence of important biota (e.g. rare or endemic fish species) or

conversely the degree of riverine degradation, i.e. the greater the catchment degradation the lower the priority to conserve the catchment. The important catchments areas are then classified as Freshwater Ecosystems Priority Areas (FEPAs). The survey area falls within an Upstream FEPA, as the systems, such as the Ongeluks and Tankwa rivers which are located downstream of the site are important regionally and are thus supported hydrologically by the study area systems.

This report also indicates the significant watercourses within the site. Any activities within these areas or the 32 m buffer will require a Water Use license (possible General Authorisation) under Section 21 c & i of the National Water Act (Act 36 of 1998).

The Present Ecological State scores (PES) for the main watercourses in the study area were rated as follows (DWS, 2014 – where A = Natural or Close to Natural):

Subquaternary Catchment Number	Present Ecological State	Ecological Importance	Ecological Sensitivity
7811	A	High	Very High
7793	A	High	High
7645	A	High	High
7868	A	High	High

These scores were substantiated by observations made in the field within the study area, and due to the overall lack of impacts or disturbance these scores for each of the watercourses within the site should be upheld. This was further substantiated by the inclusion of the Brak / Ongeluks river systems into Critical Biodiversity Areas (Type 1) or Ecological Support Areas in the WCBSP spatial data, i.e. not within the greater study area, but the site supports these systems hydrologically.

During the impact assessment undertaken, a number of potential key issues / impacts were identified, and these were assessed based on the methodology supplied by SiVEST.

The following direct impacts were assessed with regard the riparian areas and watercourses:

- Impact 1: Loss of riparian systems and disturbance of the alluvial watercourses in the construction, operational and decommissioning phases
- Impact 2: Impact on riparian systems through the possible increase in surface water runoff on riparian form and function during the operational and decommissioning phases
- Impact 3: Increase in sedimentation and erosion in the construction, operational and decommissioning phases
- Impact 4: Potential impact on localised surface water quality during the construction and decommissioning phases
- Impact 5: The No-go Alternative
- Impact 6: Cumulative impacts for the overall project due to the high number of projects surrounding this application

The proposed layout for the facility would seem to have limited impact on the aquatic environment as the proposed structures for the most part have either avoided the delineated watercourses except for access roads that will make use of existing roads crossing watercourses.

Thus, based on the findings of this study no objection to the authorisation of any of the proposed activities inclusive of the alternatives, apart from Centre Ridge Road Alternative 1, is made and thus no direct impacts on any wetlands are anticipated.

Where any road upgrades are required it is understood that these current crossings may be upgraded by increasing the current size of the culverts and providing additional erosion protection, thus resulting in a possible net benefit to the local aquatic systems. The actual requirements and designs will be finalized in the detail design phase. It is therefore recommended that these positions are assessed in the EMP walk down phase to provide detailed mitigations to the engineers as and when required.

Further, no aquatic protected or species of special concern (flora) were observed during the site visit.

Therefore, based on the site visit the significance of the impacts assessed for the aquatic systems after mitigation would be **LOW**.

This report also indicates the affected watercourses and those that would trigger the need for a Water Use License application (WULA) (a potential General Application [GA]) in terms of Section 21 c and i of the National Water Act (Act 36 of 1998) (NWA), should any construction take place within these areas. Should any of the present road crossings need to be upgraded then the opportunity exists to improve the current state (lack of habitat continuity) for example by replacing pipe culverts with box culverts, while also reducing the height of the bridge footings (culvert bases) to reinstate natural watercourse levels. **This opportunity to improve the hydrological conditions can be seen as a net benefit and has been assessed as part of the cumulative impact statement.**

Note the final number of actual water course crossings can be determined when micro-siting occurs, and the final roads layout has been defined as only 200 m roads corridor is known. This does however present an opportunity for the design team to use the buffer, to design the roads in such a manner to avoid these areas, thus minimising the number of WULAs required.

As the proposed activities have the potential to create erosion the following recommendations are reiterated:

- Vegetation clearing should occur in 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 EMP to mitigate.

- All construction materials including fuels and oil should be stored in demarcated areas that are contained within berms / bunds to avoid spread of any contamination / leaks. 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 channel. It is therefore suggested that all construction camps, lay down areas, batching plants or areas and any stores should located more than 50 m from any demarcated watercourses.

- It is also advised that an Environmental Control Officer (ECO), with a good understanding of the local flora be appointed during the construction phase. The ECO should be able to make clear recommendations with regards to the re-vegetation of the newly completed / disturbed areas along aquatic features, using selected species detailed in this report.

- All alien plant re-growth must be monitored and should these alien plants reoccur these plants should be re-eradicated. The scale of the operation does however not warrant the use of a Landscape Architect and / or Landscape Contractor.
- No transmission line towers, substations and construction camps will be placed within the delineated watercourses as well as their respective buffers without obtaining the required approvals from the relevant competent authority.
- It is further recommended that a comprehensive rehabilitation plan be implemented from the project onset within watercourse areas (including of buffers) to ensure a net benefit to the aquatic environment. This should from part of the suggested walk down as part of the final EMP preparation

The following table below summarises the various alternatives in respect of any preference, although with the exception of the two Construction camps (1 & 5) all sites / roads will either avoid the watercourses including 32m buffer or make use of existing tracks or roads. With the exception the **Centre Ridge Road Alternative 1** None, of the other alternatives proposed are considered flawed. The impacts associated with the project are considered acceptable and therefore Rondekop wind farm may proceed.

Key

PREFERRED	The alternative will result in a low impact / reduce the impact / result in a positive impact
FAVOURABLE	The impact will be relatively insignificant
LEAST PREFERRED	The alternative will result in a high impact / increase the impact
NO PREFERENCE	The alternative will result in equal impacts

Alternative	Preference	Reasons (incl. potential issues)
ACCESS ROADS		
NORTH RIDGE		
Access Road Alternative North 1	**PREFERRED**	Either makes use of existing roads and tracks or overall impact with mitigation would be LOW.
Access Road Alternative North 2	**PREFERRED**	
CENTRE RIDGE		
Access Road Alternative Centre1	**LEAST PREFERRED**	Will impact on a seepage area
Access Road Alternative Centre 2	**PREFERRED**	makes use of existing roads and tracks or overall impact with mitigation would be LOW
SOUTHERN RIDGE		
Access Road Alternative South 1	**PREFERRED**	Either makes use of existing roads and tracks or overall impact with mitigation would be LOW.
Access Road Alternative South 2	**PREFERRED**	
CONSTRUCTION CAMPS		
Construction Camp Alternative 1	**FAVOURABLE**	Requires minimal micro-siting to avoid watercourse buffer.
Construction Camp Alternative 2	**PREFERRED**	Avoid watercourses and their buffers.
Construction Camp Alternative 3	**PREFERRED**	
Construction Camp Alternative 4	**PREFERRED**	
Construction Camp Alternative 5	**FAVOURABLE**	Requires minimal micro-siting to avoid watercourse buffer.
Construction Camp Alternative 6	**PREFERRED**	Avoid watercourses and their buffers.
SUBSTATIONS		
Substation Alternative 1	**PREFERRED**	All options avoid watercourses and their buffers.
Substation Alternative 2	**PREFERRED**	

Substation Alternative 3	**PREFERRED**	
Substation Alternative 4	**PREFERRED**	
Substation Alternative 5	**PREFERRED**	
Substation Alternative 6	**PREFERRED**	

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ACRONYMS

CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Area
CSIR	Council for Scientific and Industrial Research
DWS	Department of Water and Sanitation formerly the Department of Water Affairs
EIA	Ecological Importance and Sensitivity
EIS	Ecological Importance and Sensitivity
ESA	Ecological Support Area
GIS	Geographic Information System
NFEPA	National Freshwater Ecosystem Priority Atlas (Nel, *et al*. 2011).
PES	Present Ecological State
SANBI	South African National Biodiversity Institute
SQ	Subquaternary catchment
WUL	Water Use License
WULA	Water Use License Application

COMPLIANCE WITH THE APPENDIX 6 OF THE 2014 EIA REGULATIONS

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Section where this is addressed in the Aquatic Specialist Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Page 10, 11 and Appendix 1
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page 10
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1 & 2
(cA) an indication of the quality and age of base data used for the specialist report;	Section 2
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 5, 6 , 8 and 9
d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 5
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 4
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 4, 5, 6 and 9
g) an identification of any areas to be avoided, including buffers;	Section 5 and 6
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 5
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 2
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment or activities;	Section 9
k) any mitigation measures for inclusion in the EMPr;	Section 8
l) any conditions for inclusion in the environmental authorisation;	Section 8 and 9
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 8
n) a reasoned opinion- i. as to whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 9

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Section where this is addressed in the Aquatic Specialist Report
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
q) any other information requested by the competent authority.	N/A
2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Yes – This report also meets the DWS requirements in terms of GN 267 (40713) of March 2017

SPECIALIST DECLARATION

I, Brian Colloty as the appointed independent aquatic specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- I act as the independent specialist in this application;
- I perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have no vested interest in the proposed activity proceeding;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Name of Specialist: Dr Brian Colloty

Date: 25 October 2018

SPECIALIST REPORT DETAILS

Report prepared by: Dr. Brian Colloty Pr.Sci.Nat. (Ecology) / Member SAEIES.

Expertise / Field of Study: BSc (Hons) Zoology, MSc Botany (Rivers), Ph.D Botany Conservation Importance rating (Estuaries) and interior wetland / riverine assessment consultant from 1996 to present.

I, **Dr. Brian Michael Colloty** declare that this report has been prepared independently of any influence or prejudice as may be specified by the National Department of Environmental Affairs and or Department of Water and Sanitation.

Signed:… ……………… Date:…25 October 2018…………

Appendix 1 of this report contains a detailed CV

1. Introduction

SiVEST SA (Pty) Ltd (hereafter referred to as 'SiVEST') appointed EnviroSci (Pty) Ltd to conduct an aquatic impact assessment of the proposed Rondekop Wind Energy Facility (WEF) located approximately 45 south-west of Sutherland, Northern Cape Province (Figure 1). This included delineating any natural waterbodies on the properties in question, as well as assessing the potential consequences of the layout on the surrounding watercourses. This was based on information collected during various site visits conducted within the region in late August 2012, July 2014 and March 2016, which coincided with early winter / winter rainfall within the region. A site-specific visit was conducted in early spring between 25-28 September 2018. The surveys adhered to the assessment criteria contained in the DWAF 2005 / 2008 delineation manuals and the National Wetland Classification System.

Several important national, provincial and municipal scale conservation plans were also reviewed, with the results of those studies being included in this report. Most conservation plans are produced at a high level, so it is therefore important to verify the actual status of the study area during this initial phase, prior to the final development plan being produced.

1.1 Aims and objectives

The aim of this report is to provide the applicant with the requisite delineation of any natural waterbodies that would then inform the final position of the proposed WEF and associated infrastructure, while providing the competent authorities with the relevant information to determine legislative requirements.

Certain aspects of the development may trigger the need for Section 21, Water Use License Applications (WULAs) (or general authorisation [GA] applications) such as river crossings. These applications must be submitted to the Department of Water and Sanitation (DWS) and information contained in this report must be used in the supporting documentation.

Information with regard to the state and function of the observed water bodies, suitable no-go buffers and assessment of the potential impacts is also provided.

1.2 Assumptions and Limitation

To obtain a comprehensive understanding of the dynamics of both the flora and fauna of the aquatic communities within a study site, as well as the status of endemic, rare or threatened species in any area, assessments should always consider investigations at different time scales (across seasons/years) and through replication. No base-line long-term monitoring was undertaken as part of this assessment. However, a concerted effort was made to assess as much of the potential site, as well as make use of any available literature, species distribution data and aerial photography. Furthermore, based on the previous assessments undertaken between 2012-2018 in the area this was not foreseen as a huge limiting factor. The level of investigation undertaken is sufficient to inform this assessment.

It should be emphasised that information, as presented in this document, only has reference to the study area as indicated on the accompanying maps. Therefore, this information cannot be applied to any other area without detailed investigation.

For the purposes of this report it is assumed that any existing roads and tracks within the facility will be upgraded, while the new roads and associated transmission lines can avoid or span (Figure 1) the observed watercourses as far as possible. A further assumption is that water will be sourced from a licensed resource and not illegally abstracted from any surrounding watercourses, particularly if dust suppression is required.

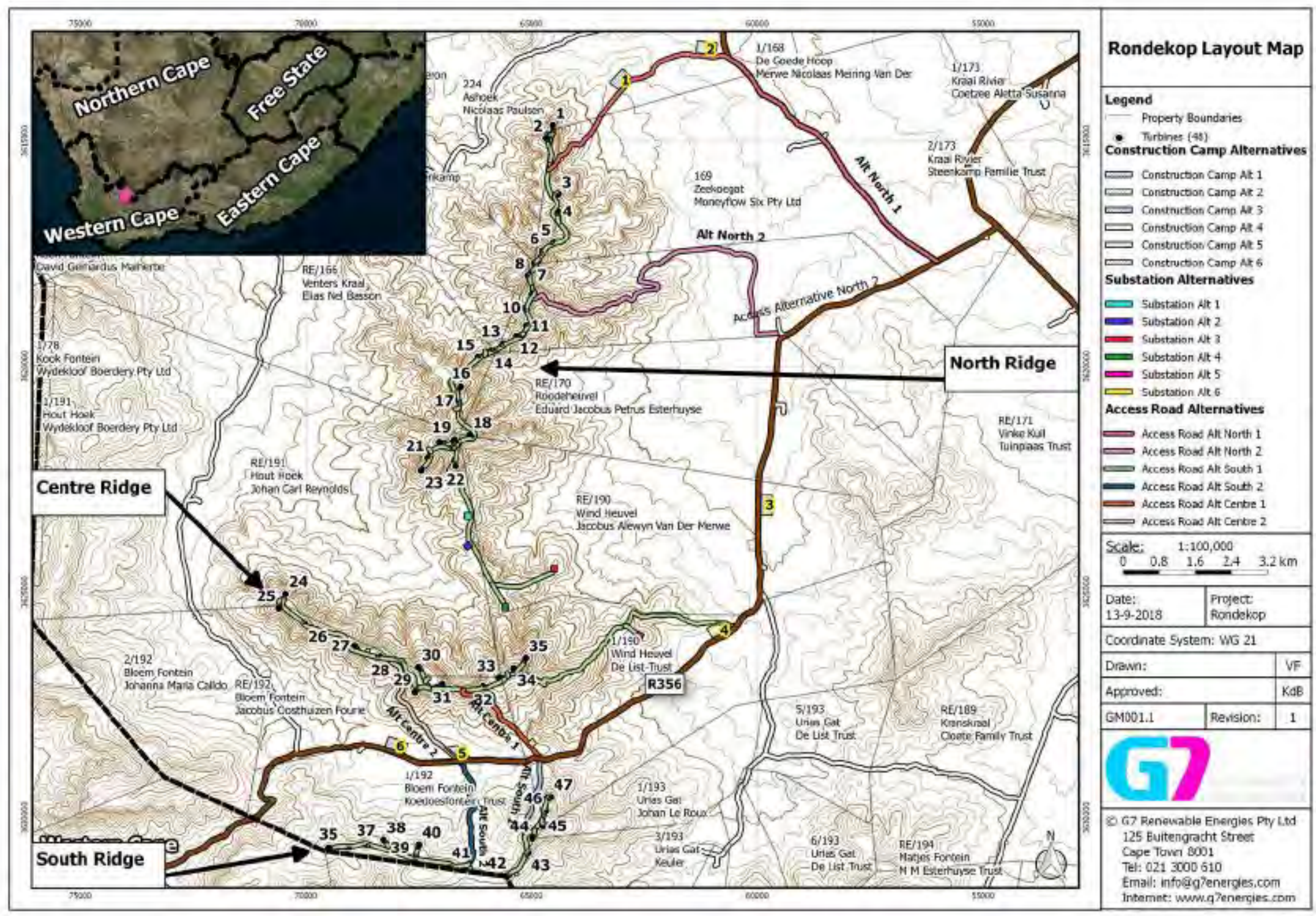

Figure 1: The proposed site layout in relation to local farms and the regional topography.

2. Terms of Reference

The following scope of work was s used as the basis of this study to fulfil the above requirements as provided by SiVEST:

General Requirements:

- Adherence to the content requirements for specialist reports in accordance with Appendix 6 of the EIA Regulations 2014, as amended;
- Adherence to all appropriate best practice guidelines, relevant legislation and authority requirements;
- Provide a thorough overview of all applicable legislation, guidelines
- Cumulative impact identification and assessment as a result of other renewable energy (RE) developments in the area (including; a cumulative environmental impact table(s) and statement, review of the specialist reports undertaken for other Renewable Energy developments and an indication of how the recommendations, mitigation measures and conclusion of the studies have been considered);
- Identification sensitive areas to be avoided (including providing shapefiles/kmls);
- Assessment of the significance of the proposed development during the Pre-construction, Construction, Operation, Decommissioning Phases and Cumulative impacts. Potential impacts should be rated in terms of the direct, indirect and cumulative:
    - Direct impacts are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.

    - Indirect impacts of an activity are indirect or induced changes that may occur as a result of 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 as a result of the activity.
    - Cumulative impacts are 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. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.
- Comparative assessment of alternatives (infrastructure alternatives have been provided):
- Recommend mitigation measures in order to minimise the impact of the proposed development; and
- Implications of specialist findings for the proposed development (e.g. permits, licenses etc).

Specific requirements:

- Describe the aquatic ecology features of the project area, with focus on features that are potentially impacted by the proposed project. The description should include the major habitat forms within the study site, giving due consideration to freshwater ecosystems, drainage lines and wetlands;
- Consider seasonal changes and long-term trends, such as due to climate change;
- Identify any Species of Special Concern or protected species on site relevant to the aquatic environment;
- Map the sensitive ecological features within the proposed project area, showing any “no-go” areas (i.e. “very high” sensitivity). Specify set-backs or buffers and provide clear reasons for these recommendations. Also map the extent of disturbance and transformation of the site;
- Identify and delineate wetlands that may occur on the site, using the relevant protocols established by DWAF (2008);
- Determine if a Water Use License (WUL) or GA is required and if so, determine the requirements thereof;
- Verify the datasets of watercourses against a digital terrain model (or slope/ contour data) to ensure that the watercourses are mapped in the correct places based on topography
- Identify and assess the potential impacts of the project (including all access roads) on the aquatic environment;
- Provide mitigation measures to include in the environmental management plan; and
- The assessment should be based on existing information, national and provincial databases, SANBI mapping, professional experience and field work conducted.

3. Project Description

Rondekop Wind Farm (Pty) Ltd propose to develop a Wind Energy Facility (WEF) of up to 325 megawatt (MW), 45 km south-west of Sutherland, in the Northern Provinces (Figure 1). The proposed facility is located within the Karoo Hoogland Local Municipality, which fall within the Namakwa District Municipality.

The Rondekop WEF will have an energy generation capacity (at 132kV point of utility connection) of up to 325 megawatt (MW), and will include the following:

- Up to 48 wind turbines, each between 3MW and 6.5MW in nameplate capacity each with a foundation of up to 30 m in diameter and up to 5 m in depth.
- The hub height of each turbine will be between 90 m and up to 140 m and its rotor diameter between 100 m and up to 180 m.
- Permanent compacted hardstanding laydown areas (also known as crane pads) for each wind turbine of 90 m x 50 m (total footprint 21.6 ha) during construction and for ongoing maintenance purposes for the lifetime of the project.
- Electrical transformers (690V/33kV) adjacent to each turbine (typical footprint of 2 m x 2 m but can be up to 10 m x 10 m at certain locations) to step up the voltage to 33kV.

- Underground 33kV cabling between turbines buried along access roads, where feasible, with overhead 33kV lines grouping turbines to crossing valleys and ridges outside of the road footprints to get to the onsite 33/132kV substation.
- Internal access roads up to 12 m wide, including structures for stormwater control would be required to access each turbine and the substation, with a total footprint of about 73 ha, of which 38,6 ha of existing roads will be upgraded. Turns will have a radius of up to 50 m for abnormal loads (especially turbine blades) to access the various turbine positions.
- Access roads to the site will be approximately 9 m wide while access roads to the substation will be approximately 6 m wide.
- One 33/132kV onsite substation. The 33kV footprint will need to be assessed as part of the WEF EIA and the 132kV footprint will be assessed in a separate basic assessment (BA) process as the current applicant will remain in control of the low voltage components of the 33/132kV substation, whereas the high voltage components of this substation will likely be ceded to Eskom shortly after the completion of construction. The total footprint of this onsite substation will be approximately 2.25 ha.
- Up to 4 (the height will be the same as the final wind turbine hub height) wind measuring lattice masts strategically placed within the wind farm development footprint to collect data on wind conditions during the operational phase.
- Temporary infrastructure including a construction camp (~13ha) which includes an on-site concrete batching plant for use during the construction phase and for offices, administration, operations and maintenance buildings during the operational phase.
- Fencing will be limited around the construction camp and batching plant. The entire facility would not be fenced off. The height of fences around the construction camp are anticipated to be up to 6 m.
- Temporary infrastructure to obtain water from available local sources/ new or existing boreholes including a potential temporary above ground pipeline (approximately 35cm diameter) to feed water to the on-site batching plant. Water will potentially be stored in temporary water storage tanks. The necessary approvals from the DWS will be applied for separately.
- Application site is ~37 543.13 hectares (cadastral units). The total footprint of the wind farm will however be ~ 114 ha (of which ~38 ha will be upgrading of existing roads).

4. Methodology

This study followed the approaches of several national guidelines with regards to wetland assessment. These have been modified by the author, to provide a relevant mechanism of assessing the present state of the study systems, applicable to the specific environment and in a clear and objective manner, assess the potential impacts associated with the proposed development. This was coupled to a site visit conducted late September 2018, after some rainfall and or snow falls and at the start of the growth season for most plants.

Current water resource classification systems make use of the Hydrogeomorphic (HGM) approach, and for this reason, the National Wetland Classification System approach will be used in this study. It is also important to understand wetland definition, means of assessing wetland conservation and importance as well as understanding the pertinent legislation with regards to protecting wetlands. These aspects will be discussed in greater depth in this section of the report, as they form the basis of the study approach to assessing wetland impacts.

4.1 Waterbody classification systems

Since the late 1960's, wetland classification systems have undergone a series of international and national revisions. These revisions allowed for the inclusion of additional wetland types, ecological and conservation rating metrics, together with a need for a system that would allude to the functional requirements of any given wetland (Ewart-Smith *et al*., 2006). Wetland function is a consequence of biotic and abiotic factors, and wetland classification should strive to capture these aspects. **Coupled to this was the inclusion of other criteria within the classification systems to differentiate between river, riparian and wetland systems, as well as natural versus artificial waterbodies.**

The South African National Biodiversity Institute (SANBI) in collaboration with several specialists and stakeholders developed the newly revised and now accepted National Wetland Classification Systems (Ollis *et al*., 2013). This system comprises a hierarchical classification process of defining a wetland based on the principles of the hydrogeomorphic (HGM) approach at higher levels, with including structural features at the finer or lower levels of classification (Ollis *et al*., 2013).

Wetlands develop in a response to elevated water tables, linked either to rivers, groundwater flows or seepage from aquifers (Parsons, 2004). These water levels or flows then interact with localised geology and soil forms, which then determines the form and function of the respective wetlands. Water is thus the common driving force, in the formation of wetlands (DWAF, 2005). It is significant that the HGM approach has now been included in the wetland classifications as the HGM approach has been adopted throughout the water resources management realm with regards to the determination of the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) and WET-Health assessments for aquatic environments. All these systems are then easily integrated using the HGM approach in line with the Eco-classification process of river and wetland reserve determinations used by the Department of Water and Sanitation (DWS). The Ecological Reserve of a wetland or river is used by DWS to assess the water resource allocations when assessing WULAs

The NWCS process is provided in more detail in the methods section of the report, but some of the terms and definitions used in this document are present below:

Definition Box

Present Ecological State is a term for the current ecological condition of the resource. This is assessed relative to the deviation from the Reference State. Reference State/Condition is the natural or pre-impacted condition of the system. The reference state is not a static condition, but refers to the natural dynamics (range and rates of change or flux) prior to development. The PES is determined per component - for rivers and wetlands this would be for the drivers: flow, water quality and geomorphology; and the biotic response indicators: fish, macroinvertebrates, riparian vegetation and diatoms. PES categories for every component would be integrated into an overall PES for the river reach or wetland being investigated. This integrated PES is called the EcoStatus of the reach or wetland.

EcoStatus is the overall PES or current state of the resource. It represents the totality of the features and characteristics of a river and its riparian areas or wetland that bear upon its ability to support an appropriate natural flora and fauna and its capacity to provide a variety of goods and services. The EcoStatus value is an integrated ecological state made up of a combination of various PES findings from component EcoStatus assessments (such as for invertebrates, fish, riparian vegetation, geomorphology, hydrology and water quality).

Reserve: The quantity and quality of water needed to sustain basic *human needs* and *ecosystems* (e.g. estuaries, rivers, lakes, groundwater and wetlands) to ensure ecologically sustainable development and utilisation of a water resource. The *Ecological Reserve* pertains specifically to aquatic ecosystems.

Reserve requirements: The quality, quantity and reliability of water needed to satisfy the requirements of basic human needs and the Ecological Reserve (inclusive of instream requirements).

Ecological Reserve determination study: The study undertaken to determine Ecological Reserve requirements.

Licensing applications: Water users are required (by legislation) to apply for licenses prior to extracting water resources from a water catchment.

Ecological Water Requirements: This is the quality and quantity of water flowing through a natural stream course that is needed to sustain instream functions and ecosystem integrity at an acceptable level as determined during an EWR study. These then form part of the conditions for managing achievable water quantity and quality conditions as stipulated in the **Reserve Template**

Water allocation process (compulsory licensing): This is a process where all existing and new water users are requested to reapply for their licenses, particularly in stressed catchments where there is an over-allocation of water or an inequitable distribution of entitlements.

Ecoregions are geographic regions that have been delineated in a top-down manner on the basis of physical/abiotic factors. • NOTE: For purposes of the classification system, the 'Level I Ecoregions' for South Africa, Lesotho and Swaziland (Kleynhans *et al.* 2005), which have been specifically developed by the Department of Water Affairs & Forestry (DWAF) for rivers but are used for the management of inland aquatic ecosystems more generally, are applied at Level 2A of the classification system. These Ecoregions are based on physiography, climate, geology, soils and potential natural vegetation.

4.2 Wetland definition

Although the National Wetland Classification System (NWCS) (Ollis *et al*., 2013) is used to classify wetland types it is still necessary to understand the definition of a wetland. Terminology currently strives to characterise a wetland not only on its structure (visible form), but also to relate this to the function and value of any given wetland.

The Ramsar Convention definition of a wetland is widely accepted as “areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres” (Davis 1994). South Africa is a signatory to the Ramsar Convention and therefore its extremely broad definition of wetlands has been adopted for the proposed NWCS, with a few modifications.

Whereas the Ramsar Convention included marine water to a depth of six metres, the definition used for the NWCS extends to a depth of ten metres at low tide, as this is recognised as the seaward boundary of the shallow photic zone (Lombard et al., 2005). An additional minor adaptation of the definition is the removal of the term ‘fen’ as fens are considered a type of peatland. The adapted definition for the NWCS is, therefore, as follows (Ollis *et al*., 2013):

WETLAND: an area of marsh, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed ten metres.

This definition encompasses all ecosystems characterised by the permanent or periodic presence of water other than marine waters deeper than ten metres. The only legislated definition of wetlands in South Africa, however, is contained within the National Water Act (Act No. 36 of 1998) (NWA), where wetlands are defined as “land which is transitional between terrestrial and aquatic systems, where the water table is usually at, or near the surface, or the land is periodically covered with shallow water and which land in normal circumstances supports, or would support, vegetation adapted to life in saturated soil.” This definition is consistent with more precise working definitions of wetlands and therefore includes only a subset of ecosystems encapsulated in the Ramsar definition. It should be noted that the NWA definition is not concerned with marine systems and clearly distinguishes wetlands from estuaries, classifying the latter as a watercourse (Ollis *et al*., 2013). Table 1 below provides a comparison of the various wetlands included within the main sources of wetland definitions used in South Africa.

Although a subset of Ramsar-defined wetlands was used as a starting point for the compilation of the first version of the National Wetland Inventory (i.e. “wetlands”, as defined by the NWA, together with open waterbodies), it is understood that subsequent versions of the Inventory include the full suite of Ramsar-defined wetlands in order to ensure that South Africa meets its wetland inventory obligations as a signatory to the Convention (Ollis *et al.*, 2013).

Wetlands must therefore have one or more of the following attributes to meet the above definition (DWAF, 2005):

- A high-water table that results in the saturation at or near the surface, leading to anaerobic conditions developing in the top 50 cm of the soil.
- Wetland or hydromorphic soils that display characteristics resulting from prolonged saturation, i.e. mottling or grey soils

- The presence of, at least occasionally, hydrophilic plants, i.e. hydrophytes (water loving plants).

It should be noted that riparian systems that are not permanently or periodically inundated are not considered true wetlands, i.e. those associated with the drainage lines and rivers.

Table 1: Comparison of ecosystems considered to be 'wetlands' as defined by the proposed NWCS, the NWA and ecosystems included in DWAF's (2005) delineation manual.

Ecosystem	NWCS "wetland"	National Water Act wetland	DWAF (2005) delineation manual
Marine	YES	NO	NO
Estuarine	YES	NO	NO
Waterbodies deeper than 2 m (i.e. limnetic habitats often described as lakes or dams)	YES	NO	NO
Rivers, channels and canals	YES	NO[1]	NO
Inland aquatic ecosystems that are not river channels and are less than 2 m deep	YES	YES	YES
Riparian[2] areas that are permanently / periodically inundated or saturated with water within 50 cm of the surface	YES	YES	YES[3]
Riparian [3] areas that are not permanently / periodically inundated or saturated with water within 50 cm of the surface	NO	NO	YES[3]

[1] Although river channels and canals would generally not be regarded as wetlands in terms of the National Water Act, they are included as a 'watercourse' in terms of the Act

[2] According to the National Water Act and Ramsar, riparian areas are those areas that are saturated or flooded for prolonged periods and would be considered riparian wetlands, as opposed to non –wetland riparian areas that are only periodically inundated and the riparian vegetation persists due to having deep root systems drawing on water many meters below the surface.

[3] The delineation of 'riparian areas' (including both wetland and non-wetland components) is treated separately to the delineation of wetlands in DWAF's (2005) delineation manual.

4.3 National Wetland Classification System method

During this study, due to the nature of the wetlands and watercourses observed, it was determined that the newly accepted NWCS be adopted. This classification approach has integrated aspects of the HGM approach used in the WET-Health system as well as the widely accepted eco-classification approach used for rivers.

The NWCS (Ollis *et al*., 2013) as stated previously, uses hydrological and geomorphological traits to distinguish the primary wetland units, i.e. direct factors that influence wetland function. Other wetland assessment techniques, such as the DWAF (2005) delineation method, only infer wetland function based on abiotic and biotic descriptors (size, soils & vegetation) stemming from the Cowardin approach (Ollis *et al.,* 2013).

The classification system used in this study is thus based on Ollis *et al*. (2013) and is summarised below:

The NWCS has a six-tiered hierarchical structure, with four spatially nested primary levels of classification (Figure 2). The hierarchical system firstly distinguishes between Marine, Estuarine and Inland ecosystems (**Level 1**), based on the degree of connectivity the particular system has with the open ocean (greater than 10 m in depth). Level 2 then categorises the regional wetland setting using a combination of biophysical attributes at the landscape level, which operate at a broad bioregional scale.

This is opposed to specific attributes such as soils and vegetation. **Level 2** has adopted the following systems:

- Inshore bioregions (marine)
- Biogeographic zones (estuaries)
- Ecoregions (Inland)

Level 3 of the NWCS assess the topographical position of inland wetlands as this factor broadly defines certain hydrological characteristics of the inland systems. Four landscape units based on topographical position are used in distinguishing between Inland systems at this level. No subsystems are recognised for Marine systems, but estuaries are grouped according to their periodicity of connection with the marine environment, as this would affect the biotic characteristics of the estuary.

Level 4 classifies the hydrogeomorphic (HGM) units discussed earlier. The HGM units are defined as follows:

- Landform – shape and localised setting of wetland
- Hydrological characteristics – nature of water movement into, through and out of the wetland
- Hydrodynamics – the direction and strength of flow through the wetland

These factors characterise the geomorphological processes within the wetland, such as erosion and deposition, as well as the biogeochemical processes.

Level 5 of the assessment pertains to the classification of the tidal regime within the marine and estuarine environments, while the hydrological and inundation depth classes are determined for inland wetlands. Classes are based on frequency and depth of inundation, which are used to determine the functional unit of the wetlands and are considered secondary discriminators within the NWCS.

Level 6 uses six descriptors to characterise the wetland types based on biophysical features. As with Level 5, these are non-hierarchal in relation to each other and are applied in any order, dependent on the availability of information. The descriptors include:

- Geology;
- Natural vs. Artificial;
- Vegetation cover type;
- Substratum;
- Salinity; and
- Acidity or Alkalinity.

It should be noted that where sub-categories exist within the above descriptors, hierarchical systems are employed, and these are thus nested in relation to each other.

The HGM unit (Level 4) is the **focal point of the NWCS**, with the upper levels (Figure 3 – Inland systems only) providing means to classify the broad bio-geographical context for grouping functional wetland units at the HGM level, while the lower levels provide more descriptive detail on the particular wetland type characteristics of a particular HGM unit. Therefore Level 1 – 5 deals with functional aspects, while Level 6 classifies wetlands on structural aspects.

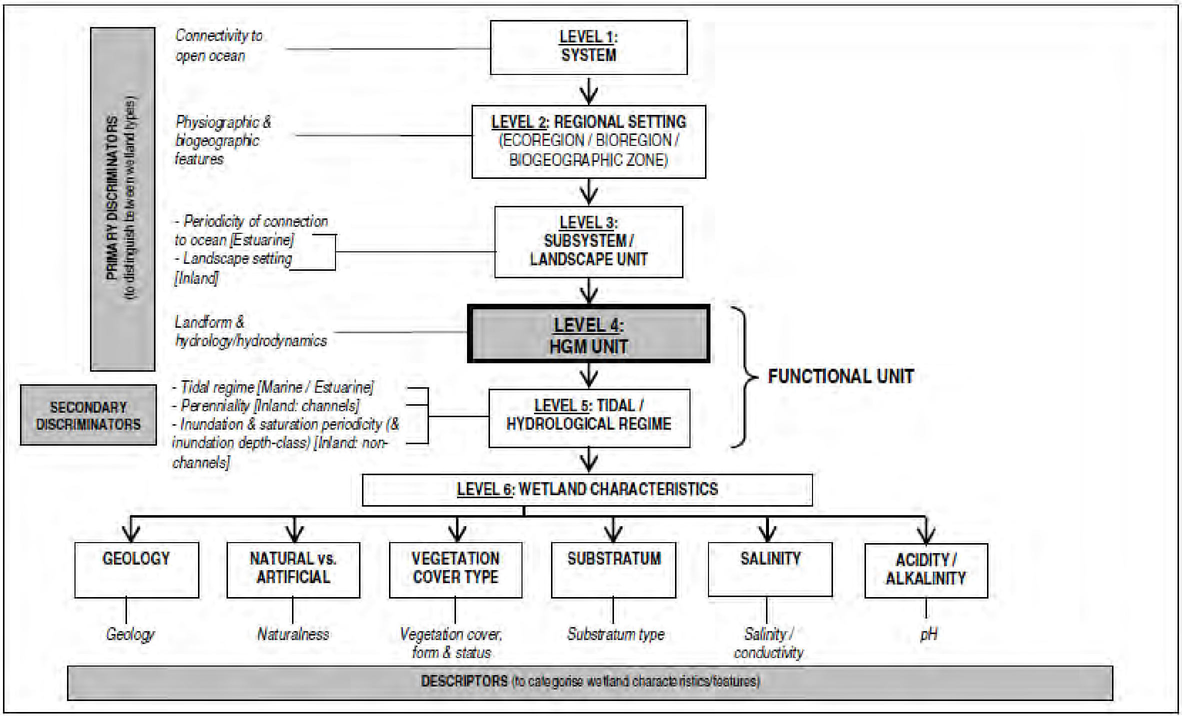

Figure 2: Basic structure of the NWCS, showing how 'primary discriminators' are applied up to Level 4 to classify Hydrogeomorphic (HGM) Units, with 'secondary discriminators' applied at Level 5 to classify the tidal/hydrological regime, and 'descriptors' applied at Level 6 to categorise the characteristics of wetlands classified up to Level 5 (From Ollis *et al.*, 2013).

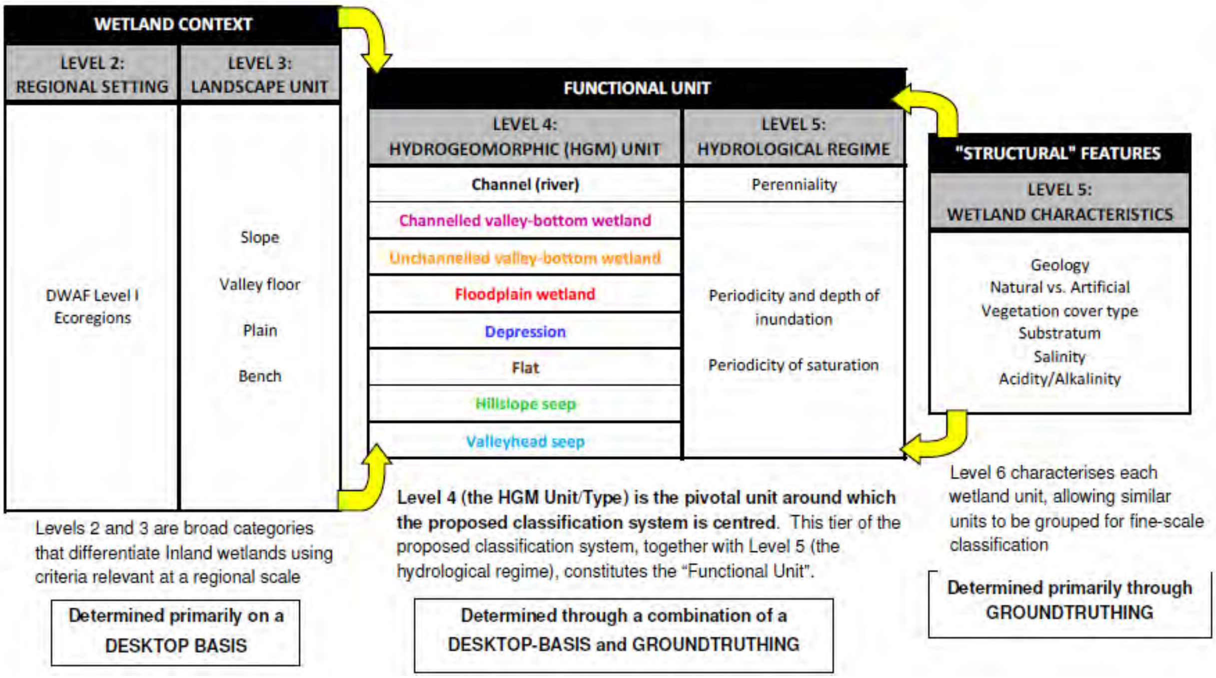

Figure 3: Illustration of the conceptual relationship of HGM Units (at Level 4) with higher and lower levels (relative sizes of the boxes show the increasing spatial resolution and level of detail from the higher to the lower levels) for Inland Systems (from Ollis *et al.*, 2013).

4.4 Waterbody condition

To assess the PES) or condition of the observed wetlands, a modified Wetland Index of Habitat Integrity (DWAF, 2007) was used. The Wetland Index of Habitat Integrity (WETLAND-IHI) is a tool developed for use in the National Aquatic Ecosystem Health Monitoring Programme (NAEHMP), formerly known as the River Health Programme

(RHP). The output scores from the WETLAND-IHI model are presented in the standard DWAF A-F ecological categories (Table 2) and provide a score of the PES of the habitat integrity of the wetland system being examined. The author has included additional criteria into the model-based system to include additional wetland types. This system is preferred when compared to systems such as WET-Health – wetland management series (WRC 2009), as WET-Health (Level 1) was developed with wetland rehabilitation in mind and is not always suitable for impact assessments. This coupled with the degraded state of the wetlands in the study area, indicated that a complex study approach was not warranted, i.e. conduct a Wet-Health Level 2 and WET-Ecosystems Services study required for an impact assessment.

Table 2: Description of A – F ecological categories based on Kleynhans *et al*., (2005)

ECOLOGICAL CATEGORY	ECOLOGICAL DESCRIPTION	MANAGEMENT PERSPECTIVE
A	Unmodified, natural.	Protected systems; relatively untouched by human hands; no discharges or impoundments allowed
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.	Some human-related disturbance, but mostly of low impact potential
C	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	**Multiple disturbances associated with need for socio-economic development, e.g. impoundment, habitat modification and water quality degradation**
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.	**Often characterized by high human densities or extensive resource exploitation. Management intervention is needed to improve health, e.g. to restore flow patterns, river habitats or water quality**
F	Critically / Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.	

The WETLAND-IHI model is composed of four modules. The “Hydrology”, “Geomorphology” and “Water Quality” modules all assess the contemporary driving processes behind wetland formation and maintenance. The last module, “Vegetation Alteration”, provides an indication of the intensity of human landuse activities on the wetland surface itself and how these may have modified the condition of the wetland. The integration of the scores from these 4 modules provides an overall PES score for the wetland system being examined. The WETLAND-IHI model is an MS Excel-based model, and the data required for the assessment are generated during a site visit.

Additional data may be obtained from remotely sensed imagery (aerial photos; maps and/or satellite imagery) to assist with the assessment. The interface of the WETLAND-IHI has been developed in a format which is similar to DWA’s River EcoStatus models which are currently used for the assessment of PES in riverine environments.

4.5 Aquatic ecosystem importance and function

South Africa is a Contracting Party to the Ramsar Convention on Wetlands, signed in Ramsar, Iran, in 1971, and has thus committed itself to this intergovernmental treaty, which provides the framework for the national protection of wetlands and the resources they could provide. Wetland conservation is now driven by the South African National Biodiversity Institute, a requirement under the National Environmental Management: Biodiversity Act (No 10 of 2004).

Wetlands are among the most valuable and productive ecosystems on earth, providing important opportunities for sustainable development (Davies and Day, 1998). However, wetlands in South Africa are still rapidly being lost or degraded through direct human induced pressures (Nel *et al.,* 2004).

The most common attributes or goods and services provided by wetlands include:

- Improve water quality;
- Impede flow and reduce the occurrence of floods;
- Reeds and sedges used in construction and traditional crafts;
- Bulbs and tubers, a source of food and natural medicine;
- Store water and maintain base flow of rivers;
- Trap sediments; and
- Reduce the number of water-borne diseases.

In terms of this study, the wetlands provide ecological (environmental) value to the area acting as refugia for various wetland associated plants, butterflies and birds.

In the past wetland conservation has focused on biodiversity as a means of substantiating the protection of wetland habitat. However not all wetlands provide such motivation for their protection, thus wetland managers and conservationists began assessing the importance of wetland function within an ecosystem.

Table 3 below summarises the importance of wetland function when related to ecosystem services or ecoservices (Kotze *et al*., 2008). One such example is emergent reed bed wetlands that function as transformers converting inorganic nutrients into organic compounds (Mitsch and Gosselink, 2000).

Table 3: Summary of direct and indirect ecoservices provided by wetlands from Kotze *et al*., 2008

Ecosystem services supplied by wetlands	Indirect benefits	Hydro-geochemical benefits		Flood attenuation
				Stream flow regulation
			Water quality enhancement benefits	Sediment trapping
				Phosphate assimilation
				Nitrate assimilation
				Toxicant assimilation
				Erosion control
				Carbon storage
				Biodiversity maintenance
	Direct benefits			*Provision of water for human use*
				Provision of harvestable resources[2]
				Provision of cultivated foods
				Cultural significance
				Tourism and recreation
				Education and research

Conservation importance of the individual wetlands was based on the following criteria:

- Habitat uniqueness;
- Species of conservation concern;
- Habitat fragmentation or rather, continuity or intactness with regards to ecological corridors; and
- Ecosystem service (social and ecological).

The presence of any or a combination of the above criteria would result in a HIGH conservation rating if the wetland was found in a near natural state (high PES). Should any of the habitats be found modified the conservation importance would rate as MEDIUM, unless a Species of Conservation Concern (SCC) was observed, in which case it would receive a HIGH rating. Any system that was highly modified (low PES) or had none of the above criteria, received a LOW conservation importance rating. Wetlands with HIGH and MEDIUM ratings should thus be excluded from development with incorporation into a suitable open space system, with the maximum possible buffer being applied. Natural wetlands or Wetlands that resemble some form of the past landscape but receive a LOW conservation importance rating could be included into stormwater management features, and should not be developed to retain the function of any ecological corridors.

4.6 Relevant wetland legislation and policy

Locally the South African Constitution, seven (7) Acts and two (2) international treaties allow for the protection of wetlands and rivers. These systems are protected from destruction or pollution by the following:

- Section 24 of The Constitution of the Republic of South Africa;
- Agenda 21 – Action plan for sustainable development of the Department of Environmental Affairs and Tourism (DEAT) 1998;
- The Ramsar Convention, 1971 including the Wetland Conservation Programme (DEAT) and the National Wetland Rehabilitation Initiative (DEAT, 2000);
- National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998) inclusive of all amendments, as well as the NEM: Biodiversity Act;
- National Water Act, 1998 (Act No. 36 of 1998);
- Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983); and
- Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).
- Nature and Environmental Conservation Ordinance (No. 19 of 1974)
- National Forest Act (No. 84 of 1998)
- National Heritage Resources Act (No. 25 of 1999)

NEMA and the Conservation of Agricultural Resources Act (CARA), 1983 (Act No. 43 of 1983) would also apply to this project. These Acts have categorised many invasive plants together with associated obligations on the land owner. A number of Category 1 & 2 plants were observed in several areas of the site under investigation and are listed in the ecological assessment.

4.7 Provincial legislation and policy

Currently there are no formalised riverine or wetland buffers distances provided by the provincial authorities and as such the buffer model as described Macfarlane *et al*., 2017 wetlands, rivers and estuaries was used.

These buffer models are based on the condition of the waterbody, the state of the remainder of the site, coupled to the type of development, as wells as the proposed alteration of hydrological flows. Based then on the information known for the site the buffer model provided the following:

1. Construction period: 28 m
2. Operation period: 20 m

However, as some rivers within the study area have been highlighted as Critical Biodiversity Areas (CBA1) per the Western Cape Biodiversity Spatial Plan (WCBSP) 2017 (Pool-Stanvliet, *et al.* 2017) with a 32 m buffer (See Figure 7), a buffer of 32 m on all watercourses is upheld.

Note: The project is located within the Northern Cape Province, but the affected catchments span the provincial boundary, thus both the Northern and Western Cape legislation / requirements have been considered.

Other policies that are relevant include:

- Provincial Nature Conservation Ordinance (PNCO) – Protected Flora. Any plants found within the sites are described in the ecological assessment.
- National Freshwater Ecosystems Priority Areas (NFEPA) – (Nel *et al.,* 2011). This mapping product highlights potential rivers and wetlands that should be earmarked for conservation on a national basis.

5. Description of the affected environment

As previously mentioned the site was assessed during a two site visit, to confirm the current state of the environment. This coincided with some rain, and the onset of the spring growth season. Due to the nature of the aquatic systems, this was enough to gain an understanding of these, coupled to information collected within the region from 2012 onwards by the report author in other portions of the same catchments.

Although the project site boundary spans several catchments, actual proposed development occurs within the following catchments within the Nama Karoo ecoregion (Figure 4):

1. E23B Windheuwel (Tankwa)
2. E23C Houthoek (Tankwa)
3. E23H Brak (Ongeluks)

These catchments are characterised by several perennial watercourses and drainage lines associated with these mainstem systems listed above and located within the greater Tankwa, Brak or Ongeluks rivers catchments respectively.

Overall, these catchment and subsequent rivers / watercourses are largely in a natural state. Current impacts occur in localised areas and included the following:

- Erosion because of road crossings (Plate 1);
- Several farm dams (Figure 5); and
- Undersized culverts within present day road crossings (Plate 2).

Absent from the study area were the typical Juncus wetlands (valley bottom wetland types – with and without channels) with the closest natural wetland system being more than 3 km from the site boundary. Thus, the systems within the study area are alluvial systems (Plate 3), characterised as natural sediment transport mechanisms within the regional environment. The lack of any natural wetlands (pans and or valley bottom systems) was also substantiated by the National Wetland Inventory v5.2 spatial data (Figure 5)

In terms of the NFEPA assessment, all of the watercourses within the site have been assigned a condition score of AB (Nel et al. 2011), indicating that they are largely intact and of biological significance. This is largely due to these catchments falling within the headwaters of the Brak/ Ongeluks and Tankwa rivers respectively. However, as the study area systems are mostly ephemeral, these don't support any wide riparian zones and the vegetation associated with these watercourses was between 0.5 m and 12 m wide. Species consisted mostly of *Searsia* species (S. *undulata, lancea* & *crenata*) and *Vachellia karroo*. Where broader river valleys occur, *Tamarix usenoides* and *Galenia africana* were observed, while in narrow areas in the higher lying watercourses, *Salix mucronata* were also noted.

The NFEPA (Nel *et al*., 2011), also earmarked sub-quaternaries, based either on the presence of important biota (e.g. rare or endemic fish species) or conversely the degree of riverine degradation, i.e. the greater the catchment degradation the lower the priority to conserve the catchment. The important catchments areas are then classified as Freshwater Ecosystems Priority Areas or FEPAs. The survey area falls within Upstream FEPAs, as systems, outside of the project area, such as the Brak, Ongeluks, Houthoek and Tankwa rivers located downstream are important regionally (Figure 6 below) and are supported hydrologically by the study area systems.

Figure 7 below, indicates significant watercourses within the site (Plate 3, below). Any activities within these areas or the 32 m buffer will require a WUL (possible GA) under Section 21 c & I of the NWA, 1998.

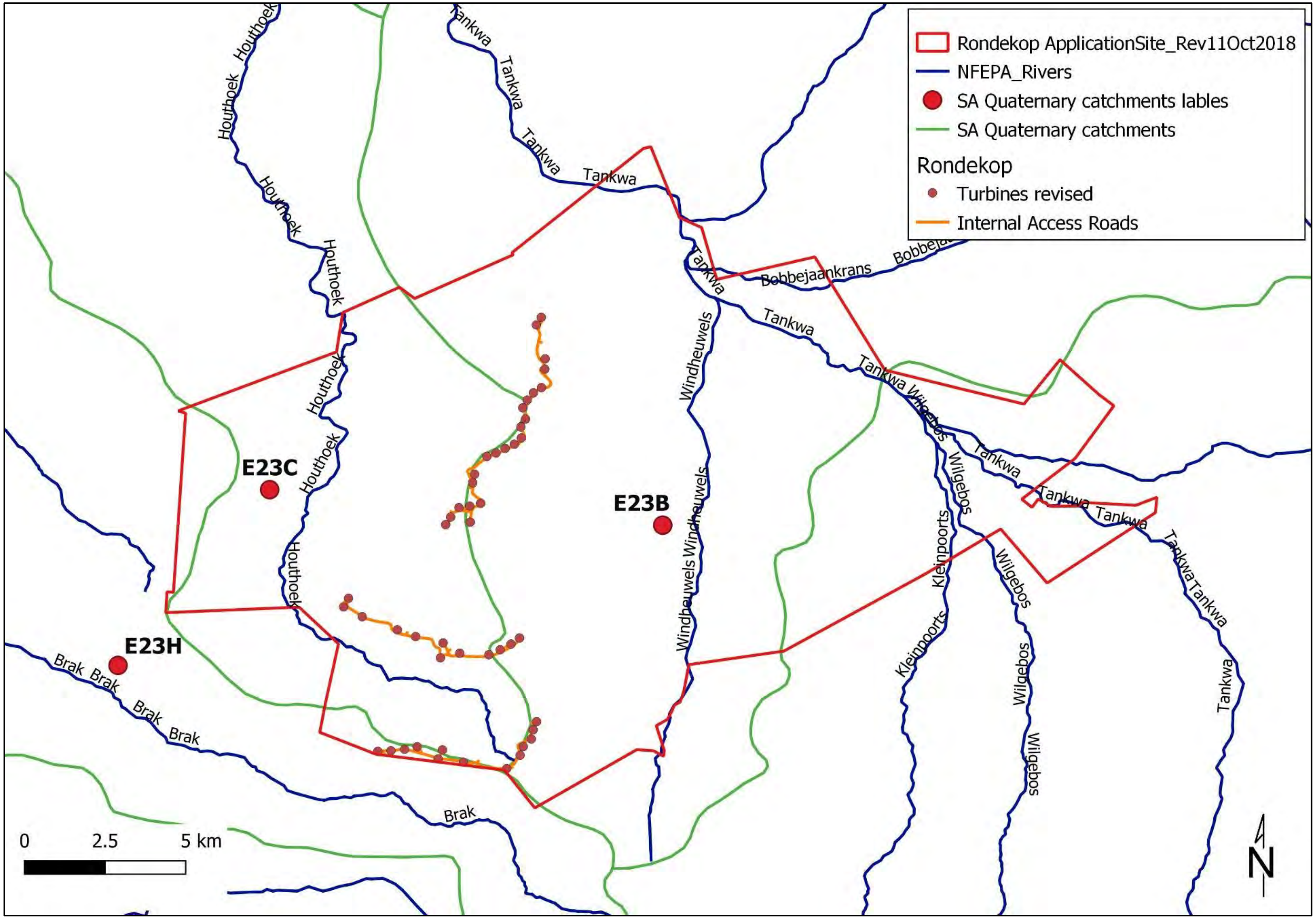

Figure 4: Project locality map indicating the various quaternary catchment boundaries (green line) in relation to the study area (Source DWS and NGI).

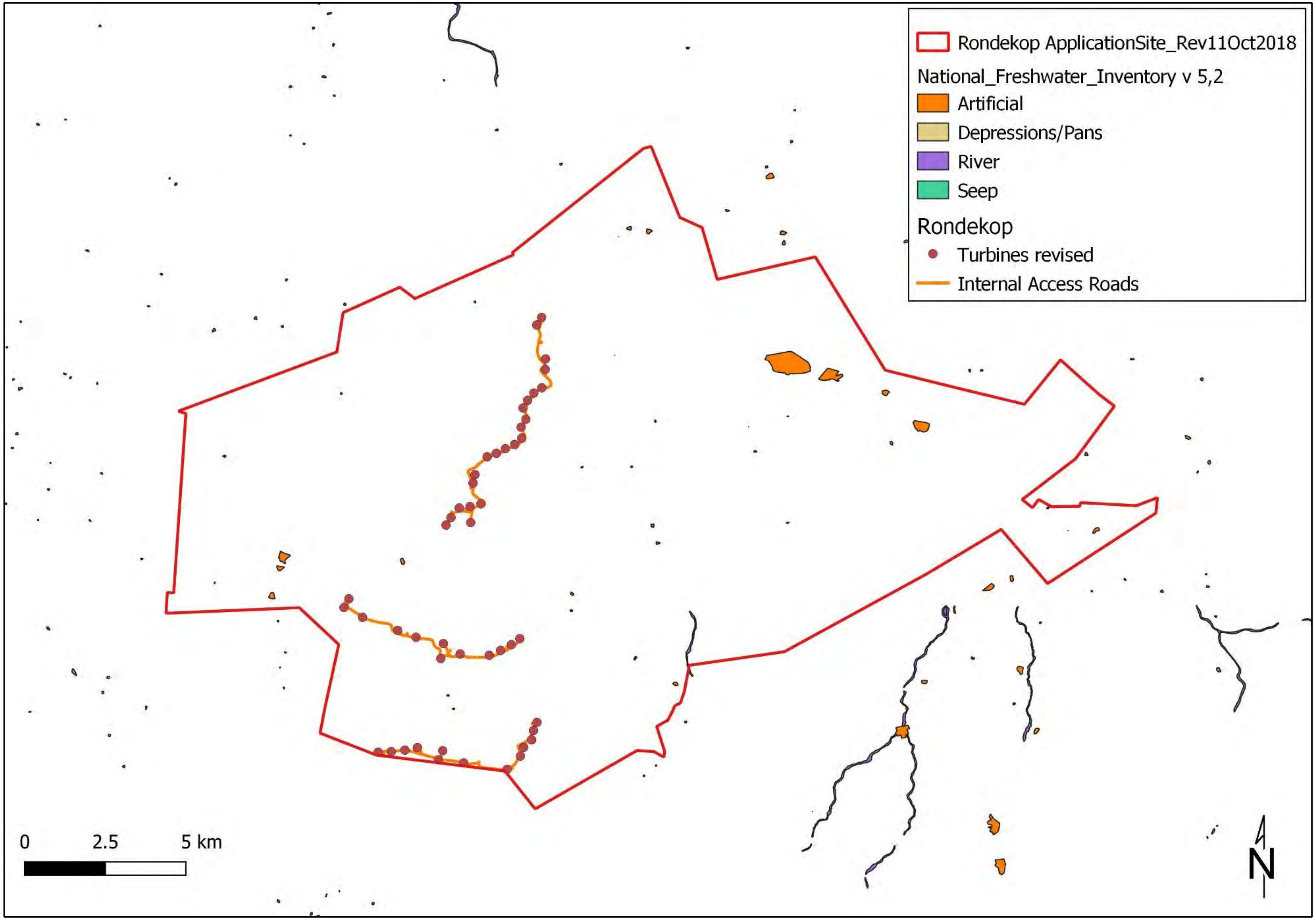

Figure 5: The various dams within or near the property identified in the National Wetland Inventory V5.2 (2018), with no natural wetlands being observed within the 500m of the boundary.

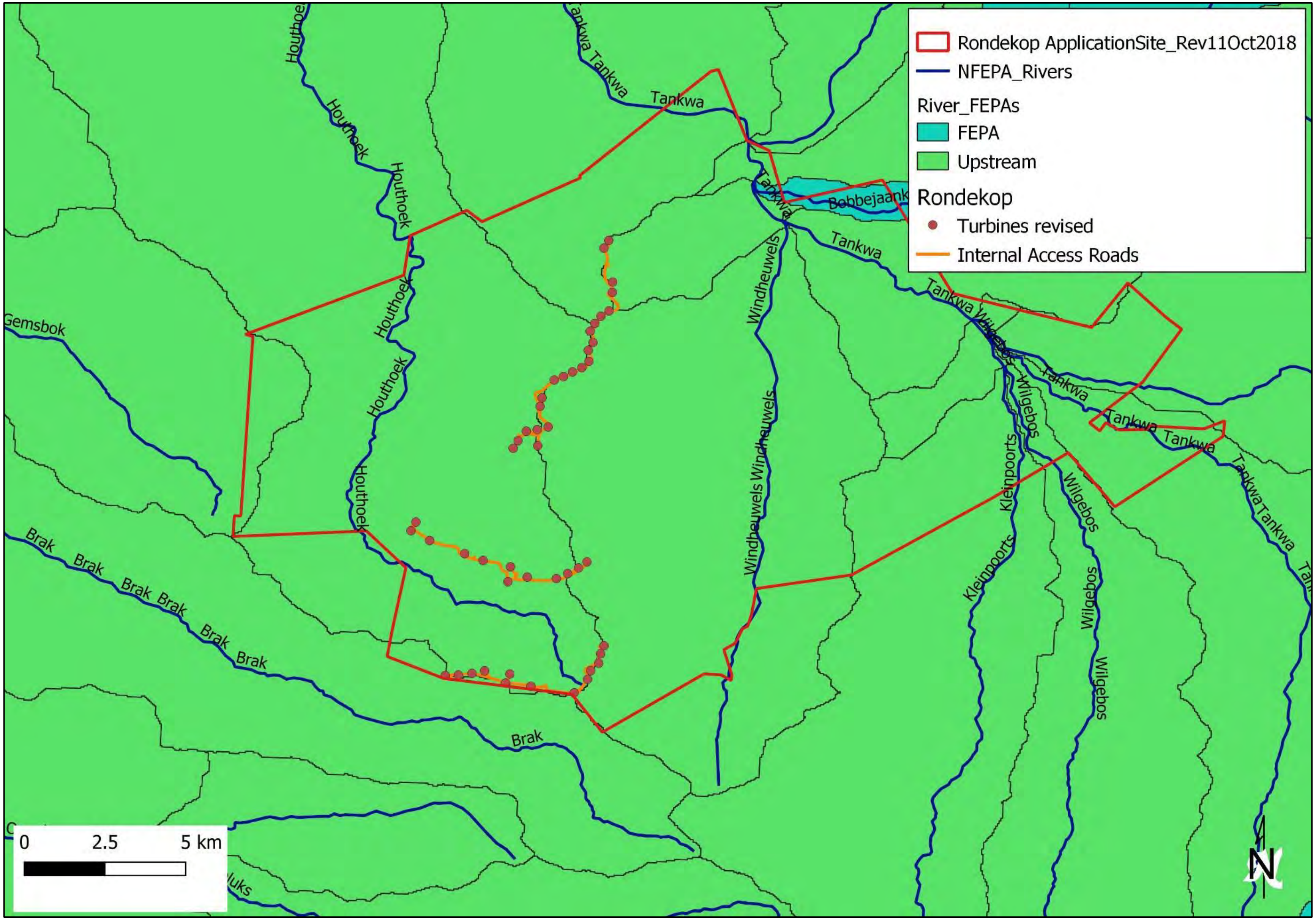

Figure 6: The respective subquaternary catchments rated in terms of Freshwater Ecosystem Priority Areas (FEPAs) in relation to the study area

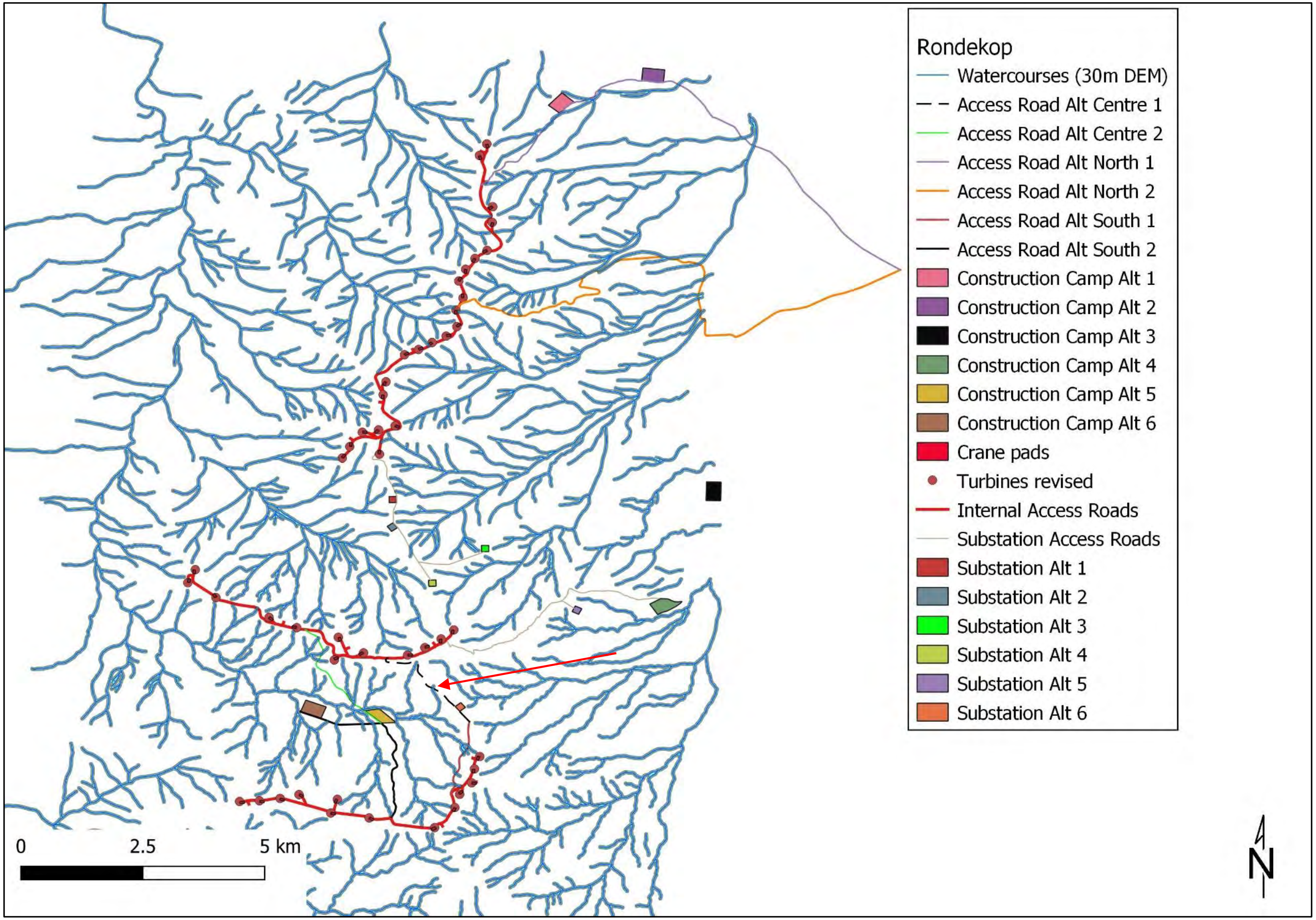

Figure 7: Watercourses within the study area created using 30m data supplied by the USGS and verified using NGI 1:50 000 topo data in relation to the activities, alternatives and the 32m watercourse buffer with the position of a small seepage wetland indicated by the red arrow

Plate 1: A view of the river bed erosion below an existing culvert (32.707867S 20.364135E)

Plate 2: A view of an existing pipe culvert crossing on the R356 (32.7817023S 20.3044875E)

Plate 3: Typical watercourse within the study area, showing the alluvial nature of the river bed (32.693995S 20.358680E)

6. Present Ecological State and conservation importance

The PES of a river represents the extent to which it has changed from the reference or near pristine condition (Category A) towards a highly impacted system where there has been an extensive loss of natural habit and biota, as well as ecosystem functioning (Category E).

The PES scores have been revised for the country and based on the new models, aspects of functional importance as well as direct and indirect impacts have been included (DWS, 2014). The new PES system also incorporates Ecological Importance (EI) and Ecological Sensitivity (ES) separately as opposed to Ecological Importance and Sensitivity (EIS) in the old model, although the new model is still heavily centred on rating rivers using broad fish, invertebrate, riparian vegetation and water quality indicators. The Recommended Ecological Category (REC) is still contained within the new models, with the default REC being B, when little or no information is available to assess the system or when only one of the above-mentioned parameters are assessed or the overall PES is rated between a C or D.

The PES for the main watercourses in the study area were rated as follows (DWS, 2014 – where A = Natural or Close to Natural):

Subquaternary Catchment Number	Present Ecological State	Ecological Importance	Ecological Sensitivity
7811	A	High	Very High
7793	A	High	High
7645	A	High	High
7868	A	High	High

These scores were substantiated by observations made in the field within the study area, and due to the overall lack of impacts or disturbance these scores for each of the watercourses within the site could be upheld. This was further substantiated by the inclusion of the Brak / Ongeluks systems into CBA (Type 1) or ESA in the WCBSP spatial data (Figure 8)

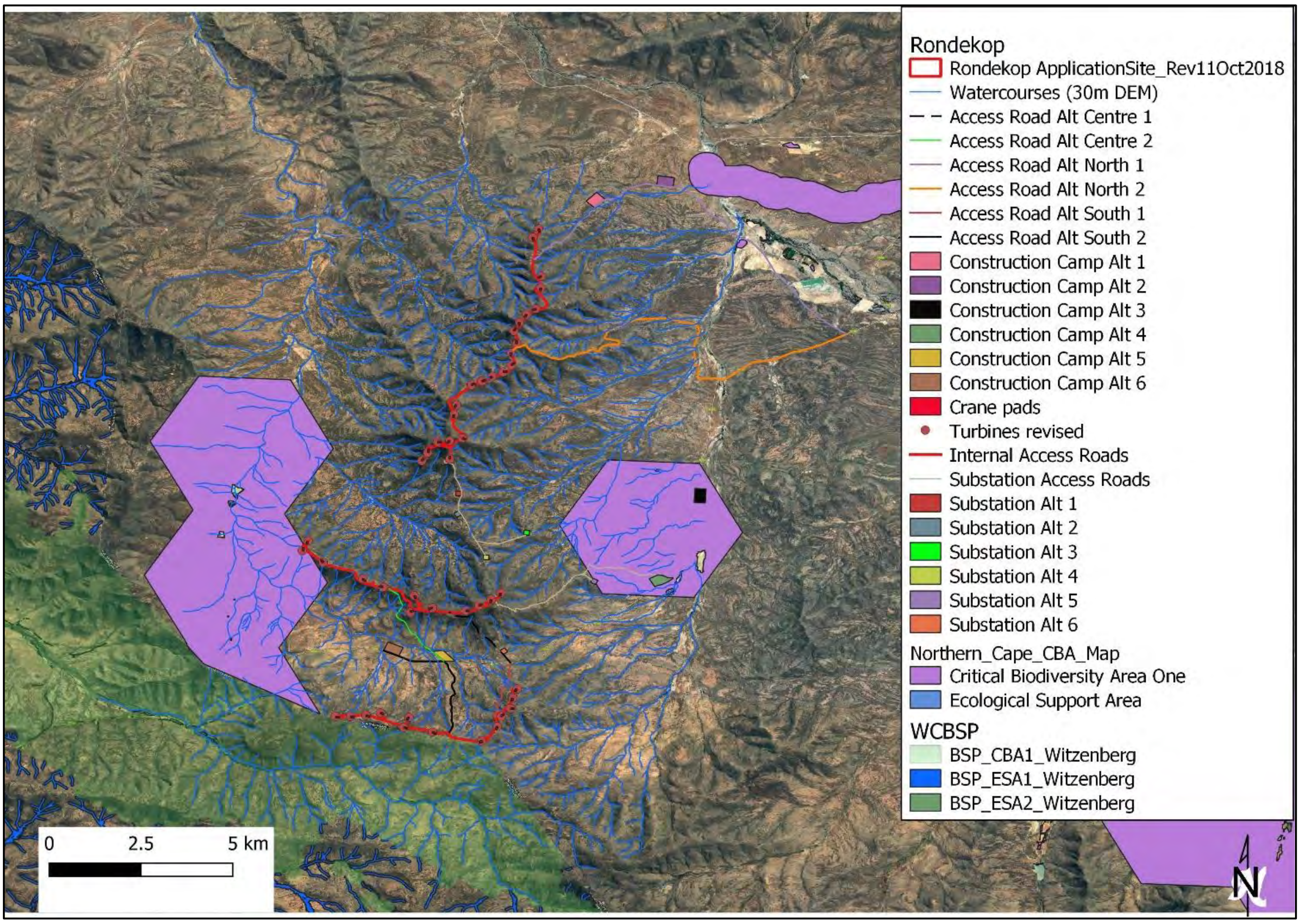

Figure 8: Critical Biodiversity Areas as per the Western Cape Biodiversity Spatial Plan and the Northern Cape Critical Biodiversity Map.

7. Permit requirements

Based on an assessment of the proposed activities and past engagement with DWS, the following WULs/ GA's could be required based on the following thresholds as listed in the following Government Notices, however ultimately the Department of Water and Sanitation (DWS) will determine if a GA or full WULA will be required during the pre-application process (Phase 1):

- **DWS Notice 538 of 2016, 2 September in GG 40243**– Section 21 a & b, Abstraction and Storage of water.
- **Government Notice 509 in GG 40229 of 26 August 2016 –** Section 21 c & i, Impeding or diverting the flow of water in a watercourse and or altering the bed, banks, course or characteristics of a watercourse.
- **Government Notice 665, 6 September 2013 in GG 36820** (expired as GA is only valid for 5 years) – Section 21g Disposing of waste in a manner that may detrimentally impact on a water source which includes temporary storage of domestic waste water i.e. conservancy tanks under Section 37 of the notice.

	Water Use Activity	**Applicable to this development proposal**
S21(a)	Taking water from a water resource	Yes, as water might be abstracted from dams and/ or boreholes. GA allows for a maximum of 45 m^3/ha/year from a borehole or 80 000 m^3 from a surface water resource per year per property. Note ha refers to the total size of the individual farm portions. The WEF will require no more than 26 000m^3 per annum during construction phase and insignificant quantity of water during the operational phase. Therefore, a GA would likely be required.
S21(b)	Storing water	If the total volume stored is greater than 40 000 m^3 then a full Water Use License will be required. This is however unlikely that onsite water storage for the purpose of the WEF would ever exceed this threshold.
S21(c)	Impeding or diverting the flow of water in a watercourse	Yes – although existing roads would be upgraded where possible in order to reduce the number of new access roads, several new crossings of watercourses will be required. A GA process can potentially be followed.
S21(d)	Engaging in a stream flow reduction activity	Not applicable
S21(e)	Engaging in a controlled activity	Not applicable
S21(f)	Discharging waste or water containing waste into a water resource through a pipe, canal, sewer or other conduit	Not applicable

	Water Use Activity	Applicable to this development proposal
S21(g)	Disposing of waste in a manner which may detrimentally impact on a water resource	Typically, the conservancy tanks at construction camps and then O/M buildings require a license (GA if volumes are below 5000 m^3 noting that GA expired 30.8.2018). If above this threshold then a full WUL is required.
S21(h)	Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process	Not applicable
S21(i)	Altering the bed, banks, course or characteristics of a watercourse	Yes – although existing roads would be upgraded where possible in order to reduce the number of new access roads, several new crossings of watercourses will be required. A GA process can potentially be followed.
S21(j)	Removing, discharging or disposing of water found underground for the continuation of an activity or for the safety of persons	Not applicable
S21(k)	Using water for recreational purposes	Not applicable

8. Impact assessment

During the impact assessment undertaken as part of this EIA a number of potential key issues / impacts were identified and these were assessed based on the methodology supplied by SiVEST.

The following direct impacts were assessed with regard the riparian areas and watercourses, .i.e. any areas with wetlands would be avoided:

- Impact 1: Loss of riparian systems and disturbance of the alluvial watercourses in the construction, operational and decommissioning phases
- Impact 2: Impact on riparian systems through the possible increase in surface water runoff on riparian form and function during the operational and decommissioning phases
- Impact 3: Increase in sedimentation and erosion in the construction, operational and decommissioning phases
- Impact 4: Potential impact on localised surface water quality during the construction and decommissioning phases
- Impact 5: The No-go Alternative
- Impact 6: Cumulative impacts for the overall project due to the high number of projects surrounding this application

The impacts were assessed as follows, noting that the impact statements are based on post mitigation activities:

Environmental Parameter	Impact 1 - Loss of riparian systems and disturbance to alluvial watercourses during construction, operations and decommissioning phases
Issue/Impact/Environmental Effect/Nature	The physical removal of the riparian zones and disturbance of any alluvial watercourses by new road crossings or upgrades of existing roads are likely within the watercourses within the site. These disturbances will be the greatest during the construction and again in the decommissioning phases as the related disturbances could result in loss and/or damaged vegetation, while to a lesser degree in the operation phase (i.e. as and when maintenance of roads occur).
Extent	Local
Probability	Definite
Reversibility	Completely reversible
Irreplaceable loss of resources	A marginal loss in resources
Duration	With mitigation and completion of the construction phase the impacts would be minimal, however the duration would be long term
Cumulative effect	The increase in surface run-off velocities and the reduction in the potential for groundwater infiltration is likely to occur considering that the site is near the main drainage channels, however the annual rainfall figures are low and this impact is not anticipated if the mitigation measures listed are properly implemented.

Intensity/magnitude	The overall intensity of the impact would be Low when compared to scale of the impact and the remaining habitat within the catchment, coupled to the overall avoidance of creating high numbers of new crossings	
Significance Rating	Impact would be considered LOW with mitigations in place based on the intensity of the impact described above	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	1
Probability	4	3
Reversibility	1	1
Irreplaceable loss	2	2
Duration	3	1
Cumulative effect	2	1
Intensity/magnitude	1	1
Significance rating	-14 (LOW negative)	-9 (LOW negative)
Mitigation measures	• Where new water course crossings are required, the engineering team must provide an effective means to minimise the potential upstream and downstream effects of sedimentation and erosion (erosion protection) as well minimise the loss of riparian vegetation (reduce footprint as much as possible). • During the construction and operational /decommissioning phase, monitor culverts to see if erosion issues arise and if any erosion control is required. • Where possible culvert bases must be placed as close as possible with natural levels in mind so that these don't from additional steps / barriers. • Vegetation clearing should occur in 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. • It is also advised that an Environmental Control Officer (ECO), with a good understanding of the local flora be appointed during the construction phase. The ECO should be able to make clear recommendations with regards to the re-vegetation of the newly completed / disturbed areas within aquatic environment, using selected species detailed in this report. • All alien plant re-growth must be monitored, and should it occur these plants should be eradicated. The scale of the operation does however not warrant the use of a Landscape Architect and / or Landscape Contractor.	

Environmental Parameter	Impact 2 - Impact on riparian systems through the possible increase in surface water runoff on downstream riparian form and function, due to impacts to the hydrological regime such as alteration of surface run-off patterns
Issue/Impact/Environmental Effect/Nature	This could occur within the operational and decommissioning phases. when any of the hard or compacted surfaces (roads or hard stand areas) increase the volume and velocity of the surface runoff increases. This could impact the hydrological regime through the increase in flows that are concentrated in area, and as most plants are drought tolerant an

	increase in water will allow for other species to develop and outcompete typical plant species found within the region. This then affects the structure (i.e. larger taller grasses / shrubs / trees) and function (greater attenuation of flows, restricting any runoff from reaching downstream areas). The opposite can also happen. If flows are too concentrated with high velocities, scour and erosion results, with a complete reduction or disturbance of riparian habitat.	
Extent	Local	
Probability	Probable	
Reversibility	Completely reversible – water courses can be reinstated and over a period the riparian functionality / species composition will recover	
Irreplaceable loss of resources	A marginal loss in resources	
Duration	With mitigation the impacts would be minimal however the duration would be long term	
Cumulative effect	Downstream alteration of hydrological regimes due to the increased run-off from the area. However due to low mean annual runoff within the region this is not anticipated due to the nature of the development together with the proposed layout.	
Intensity/magnitude	The overall intensity of the impact would be Low when compared to scale of the impact and the remaining habitat within he catchment, coupled to the overall avoidance of creating high numbers of new crossings	
Significance Rating	Impact would be considered LOW with mitigations in place based on the intensity of the impact described above	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	1
Probability	3	3
Reversibility	1	1
Irreplaceable loss	2	2
Duration	4	1
Cumulative effect	1	1
Intensity/magnitude	1	1
Significance rating	-13 (Low negative)	-9 (LOW negative)
Mitigation measures	• Vegetation clearing should occur in 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. • Any storm-water within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities • No stormwater runoff must be allowed to discharge directly into any water course along roads, and flows should thus be allowed to dissipate over a broad area covered by natural vegetation. • Stormwater from hard stand areas, buildings and substation must be managed using appropriate channels and swales when located within steep areas or have steep embankments	

Environmental Parameter	Impact 3 - Increase in sedimentation and erosion within the development footprint	
Issue/Impact/Environmental Effect/Nature	Impacts include changes to the hydrological regime such as alteration of surface run-off patterns which could occur during the construction, operational and decommissioning phases.	
Extent	Local	
Probability	Probable	
Reversibility	Completely reversible – as the scale and nature of soils the erosion can be halted and over time through alluvial deposition any erosion can be remediated	
Irreplaceable loss of resources	A marginal loss in resources	
Duration	With mitigation and completion of the construction phase the impacts would be minimal however the duration would be long term	
Cumulative effect	Erosion and sedimentation of the downstream systems and farming operations could result in cumulative impacts. However due to low mean annual runoff within the region this is not anticipated due to the nature of the development together with the proposed layout.	
Intensity/magnitude	The overall intensity of the impact would be Low when compared to scale of the impact and the remaining habitat within he catchment, coupled to the overall avoidance of creating high numbers of new crossings	
Significance Rating	Impact would be considered LOW with mitigations in place based on the intensity of the impact described above	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	1
Probability	4	3
Reversibility	3	1
Irreplaceable loss	3	2
Duration	4	1
Cumulative effect	1	1
Intensity/magnitude	2	1
Significance rating	-34 (MEDIUM negative)	-9 (LOW negative)
Mitigation measures	• Any storm-water within the site must be handled in a suitable manner, i.e. trap sediments and reduce flow velocities. Any management actions must be dealt with in the Stormwater Management Plan (SWMP) typically submitted post EA, forming part of any WULA	

Environmental Parameter	Impact 4 – Impact on localized surface water quality	
Issue/Impact/Environmental Effect/Nature	During construction and to a limited degree the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement powder, wet cement, shutter-oil, etc.) associated with site-clearing machinery and construction activities could be washed downslope via the ephemeral systems	
Extent	Local	
Probability	Probable	
Reversibility	Completely reversible	
Irreplaceable loss of resources	A marginal loss in resources	
Duration	With mitigation and completion of the construction phase the impacts would be minimal however the duration of the impacts would be long term	
Cumulative effect	However due to low mean annual runoff within the region this is not anticipated due to the nature of the development together with the proposed layout, i.e. except for the new crossings, any pollutants would not be transported significant distances downstream.	
Intensity/magnitude	The overall intensity of the impact would be Low when compared to scale of the impact and the remaining habitat within the catchment, coupled to the overall avoidance of creating high numbers of new crossings	
Significance Rating	Impact would be considered LOW with mitigations in place based on the intensity of the impact described above.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	1
Probability	4	2
Reversibility	2	1
Irreplaceable loss	1	1
Duration	4	1
Cumulative effect	1	1
Intensity/magnitude	2	1
Significance rating	-28 (Low negative)	-7 (LOW negative)
Mitigation measures	• Strict use and management of all hazardous materials used on site in line with the specific material safety data sheets, e.g. fuels must be stored within a contained / bunded site with the necessary and spill kits available. • Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.). • Containment of all contaminated water by means of careful run-off management on the development site. • Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility. • Strict control over the behaviour of construction workers, with regard littering, use and storage of chemicals.	

	• Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Construction Environmental Management Plan (CEMP) for the project and strictly enforced. Additional details in this regard in contain in Section 9 of this report and have also been considered in the mitigation assessment process.

Environmental Parameter	Impact 5 – No-go alternative	
Issue/Impact/Environmental Effect/Nature	The no-go alternative assumes that no change in land use or additional activities will occur and that the status quo will persist. This includes agricultural activates along with the impact of existing roads crossing watercourses and low level of erosion	
Extent	Local	
Probability	Probable	
Reversibility	Completely reversible	
Irreplaceable loss of resources	A marginal loss in resources	
Duration	Permanent	
Cumulative effect	Cumulative impacts can be avoided by implementing the mitigation measures by the farmers in the region. However, if the no-go alternative is implemented the mitigation measures will not be implemented as part of this project.	
Intensity/magnitude	The overall intensity of the impact would be Low when compared to scale of the impact and the remaining habitat within he catchment, coupled to the overall avoidance of creating high numbers of new crossings	
Significance Rating	Impact would be considered LOW based on the intensity of the impact described above	
	Pre-mitigation impact rating	
Extent	2	
Probability	4	
Reversibility	2	
Irreplaceable loss	3	
Duration	4	
Cumulative effect	1	
Intensity/magnitude	2	
Significance rating	-32 (MEDIUM negative)	
Mitigation measures	• No mitigation measures will be implemented with the no-go alternative	

Environmental Parameter	Impact 6 – Overall cumulative impact
Issue/Impact/Environmental Effect/Nature	In the assessment of this project, a number of projects have been assessed by the report author and include the following, while (see Figure 9) the remaining projects documents within a 50km radius have been reviewed and or sites accessed during the course of travelling between the various projects as shown in Figure 9. 1) Perdekraal East & West WEF 2) Witberg WEF 3) Esizayo WEF 4) Gunstfontein WEF 5) Hidden Valley Wind Project (Note this has been separated into three separate projects namely Karusa, Soetwater and Great Karoo); 6) Brandvalley WEF. 7) Roggeveld WEF 8) Karreebosch WEF 9) Komsberg West 10) Maralla East and West 11) Rietkloof 12) Sutherland 13) Sutherland Solar Energy Facility 14) Tooverberg 15) Kudusberg Of these potential projects, this report author has been involved in the initial EIA aquatic assessments or has managed / assisted with the WUL process for several of the projects shown above. All of the projects have indicated that this is also their intention with regard mitigation, i.e. selecting the best possible routes to minimise the local and regional impacts and improving the drainage or hydrological conditions with these rivers the cumulative impact could be seen as a net benefit. However, the worse-case scenario has been assessed below, i.e. only the minimum of mitigation be implemented by the other projects, and that flows within these systems are sporadic.
Extent	Local
Probability	Probable
Reversibility	Partly reversible
Irreplaceable loss of resources	A loss in resources will occur if a high number of new crossings especially in the case of the other projects where wetlands do occur and need to be crossed
Duration	Pre-mitigation the impact would be definite, with mitigation and completion of the construction phase the impacts would be minimal

Cumulative effect	The greatest threat to the watercourses within the region is the poor placement of roads. For the above mentioned projects, the road layouts have been revised in such a manner that all the important wetland areas / rivers were avoided, through the use of impacted areas at existing crossings. Cumulative impacts can be reduced by implementing the abovementioned mitigation measures by the holder of EAs in the region.	
Intensity/magnitude	The overall intensity of the impact would be Low when compared to scale of the impacts, the projects in relation to the remaining habitats within the catchments, coupled to the overall avoidance of creating high numbers of new crossings and their respective buffers.	
Significance Rating	Impact would be considered LOW with mitigations in place based on the intensity of the impact described above	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	1
Probability	4	3
Reversibility	3	1
Irreplaceable loss	3	2
Duration	4	3
Cumulative effect	1	1
Intensity/magnitude	2	1
Significance rating	-34 (MEDIUM negative)	-11 (LOW negative)
Mitigation measures	• Improve the current stormwater and energy dissipation features not currently found along the tracks and roads within the region • Install properly sized culverts with erosion protection measures at the present road / track crossings	

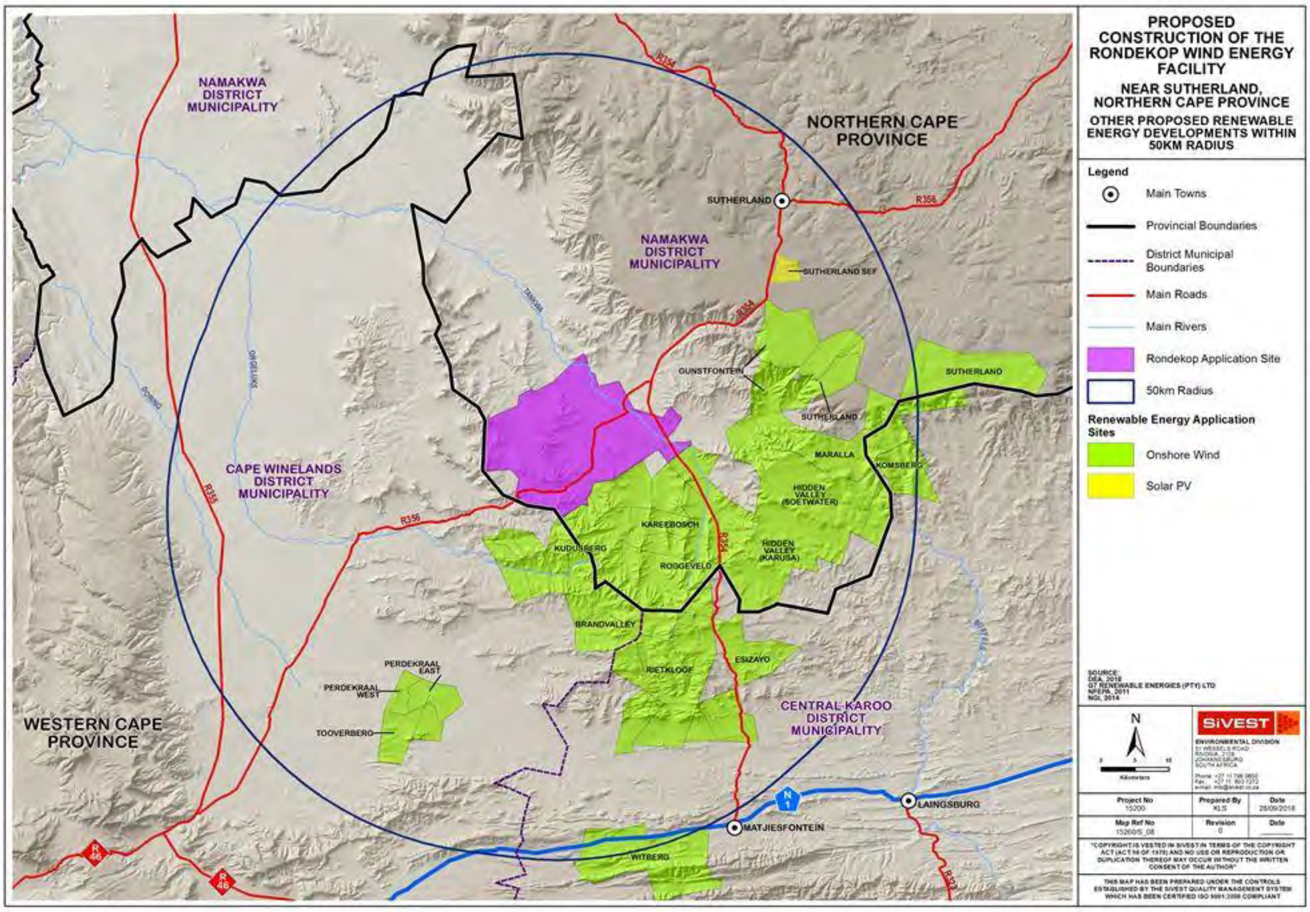

Figure 9: The Rondekop WEF project in relation to the adjacent or surrounding renewable wind and solar projects within a 50km radius)

9. Assessment of Alternatives

One layout alternative will be assessed for Rondekop WEF based on 48 wind turbines with associated crane pad areas and other associated infrastructure. The proposed layout is spread over three (3) ridges namely northern ridge, centre ridge and southern ridge. The proposed layout will be amended, as needed, based on specialist input and input from I&APs.

Road layout alternatives

Various access road alternatives are currently proposed to connect the R356 to the three ridges. The proposed access to the site is from the tarred R354 connecting Matjiesfontein and Sutherland, turning north-west onto R356 provincial gravel road and heading west from where the access roads branches off. The six (6) access road alternatives (two (2) per ridge) branch off the R356.

Considering that the proposed Rondekop WEF is to be developed on three (3) separate ridges, there are two (2) proposed access roads to each ridge, therefore six (6) access road alternatives in total.

Three access road alternatives would connect the public R356 road to the new wind farm road network between the turbines on the ridges namely:

North ridge

- Access road alternative North 1, route is approximately 11.8 km in length, almost all of which comprises an existing farm road that will need to be upgraded; or

- Access road alternative North 2 is approximately 12.8 km in length and branches off the R356 and follows an existing farm road that will need to be upgraded.

Centre ridge

- Access road alternative Centre 1 is approximately 2.6 km in length and branches off the R356 to the north and connects between turbine 31 and 32; or
- Access road alternative Centre 2 is approximately 3.1 km in length and branches off the R356 and connects to the site near turbine 28.

Southern ridge

- Access road alternative South 1 is approximately 1.9 km in length and branches off the R356 to the south and connects near turbine 45; or
- Access road alternative South 2 is approximately 4.2 km in length and branches off the R356 to the south and connects near turbine 42.

Each road section will be buffered by approximately 200 m to allow for incremental alternatives i.e. reroute within the buffer in order to avoid any sensitive features identified during the detailed specialist assessments.

Construction camps

Six (6) alternative construction camp layouts, including the area required for a batching plant, will be assessed namely construction camp:

- Construction Camp Alternative 1 is located adjacent to Access Road Alternative North 1 on the Farm 224 Ashoek at the end of an existing farm road;
- Construction camp Alternative 2 is also located adjacent to Access Road Alternative North 1 on the Farm 224 Ashoek at the end of an existing farm road;
- Construction Camp Alternative 3 is located adjacent to and east of the R356 public road on the Remainder of farm 190 Wind Heuvel;
- Construction Camp Alternative 4 is located at the intersection of an existing 4x4 track and the R356 on portion 1 of farm 190 Wind Heuvel;
- Construction Camp Alternative 5, is located at the intersection of the R356, access road alternative centre 2 and access road alternative south 1 extending to the north on the remainder of farm 192 Bloem Fontein; and
- Construction Camp Alternative 6 is located to the west of access road alternative centre 2 north of the R356 on the remainder of farm 192 Bloem Fontein.

Substations

Six (6) onsite 33/132kV substation location alternatives were identified based on technical studies which considered aspects such as topography, earth works and levelling, environmentally sensitive features, electrical losses, turbine locations and existing agricultural use. All six (6) positions are located relatively in the centre of the facility.

- Substation alternative 1 is located south of turbine 22 on the remainder of farm 191 Hout Hoek;
- Substation alternative 2 is located south of substation alternative 1 on the remainder of farm 191 Hout Hoek;
- Substation alternative 3 is located south east of substation alternative 2 on the remainder of farm 190 Wind Heuvel;

- Substation alternative 4 is located north east of substation alternative 3 on the remainder of farm 190 Wind Heuvel;
- Substation alternative 5 is located west of construction camp alternative 4 along an existing 4x4 jeep track; and
- Substation alternative 6 is located adjacent to access road alternative center 1 to the east on portion 1 of farm 190 Wind Heuvel.

The following table below summarises the various alternatives in respect of any preference, although with the exception of the two Construction camps (1 & 5) and the **Centre Ridge Road Alternative 1** all other activities will either avoid the watercourses including 32m buffer or make use of existing tracks or roads. Thus none, of the other alternatives proposed are considered flawed. The impacts associated with the project are considered acceptable and therefore Rondekop wind farm may proceed.

Key

PREFERRED	The alternative will result in a low impact / reduce the impact / result in a positive impact
FAVOURABLE	The impact will be relatively insignificant
LEAST PREFERRED	The alternative will result in a high impact / increase the impact
NO PREFERENCE	The alternative will result in equal impacts

Alternative	Preference	Reasons (incl. potential issues)
ACCESS ROADS		
NORTH RIDGE		
Access Road Alternative North 1	**PREFERRED**	Either makes use of existing roads and tracks or overall impact with mitigation would be LOW.
Access Road Alternative North 2	**PREFERRED**	
CENTRE RIDGE		
Access Road Alternative Centre1	**Least Preferred**	Will impact on a seepage area
Access Road Alternative Centre 2	**PREFERRED**	makes use of existing roads and tracks or overall impact with mitigation would be LOW
SOUTHERN RIDGE		
Access Road Alternative South 1	**PREFERRED**	Either makes use of existing roads and tracks or overall impact with mitigation would be LOW.
Access Road Alternative South 2	**PREFERRED**	
CONSTRUCTION CAMPS		
Construction Camp Alternative 1	**FAVOURABLE**	Requires minimal micro-siting to avoid watercourse buffer.
Construction Camp Alternative 2	**PREFERRED**	Avoid watercourses and their buffers.
Construction Camp Alternative 3	**PREFERRED**	
Construction Camp Alternative 4	**PREFERRED**	
Construction Camp Alternative 5	**FAVOURABLE**	Requires minimal micro-siting to avoid watercourse buffer.
Construction Camp Alternative 6	**PREFERRED**	Avoid watercourses and their buffers.
SUBSTATIONS		
Substation Alternative 1	**PREFERRED**	All options avoid watercourses and their buffers.
Substation Alternative 2	**PREFERRED**	
Substation Alternative 3	**PREFERRED**	
Substation Alternative 4	**PREFERRED**	
Substation Alternative 5	**PREFERRED**	
Substation Alternative 6	**PREFERRED**	

No-Go Alternative

It is mandatory to consider the "no-go" option in the EIA process. The no development alternative option assumes the site remains in its current state, i.e. there is no construction of a WEF and associated infrastructure in the proposed project area and the status quo would proceed.

10. Environmental Management plan

Note ECO/ESO is interchangeable depending on the final appointment by the contractor / client

Design Phase					
Objective	**Potential Impact**	**Mitigation Measures**	**Indicator/outcomes**	**Responsibility**	**Timeframes**
Ensure that the detailed design avoids all sensitive water resources	Minimise the number of impacts on the observed watercourses that would result in the potential impacts listed in this report and section below during the construction and operational phases	it is therefore recommended that these positions are assessed in the EMP walk down phase to provide detailed mitigations to the engineers as and when required.	» The impact ratings listed in this report can be upheld and the number of Water use License would be low	Holder of the EA	Prior to construction
Construction and Operation Phase					
Objective	**Potential Impact**	**Mitigation Measures**	**Indicator/outcomes**	**Responsibility**	**Timeframes**
Soil erosion control, water quality management -	Both road access alternatives per ridge connecting the site to the R354 and internal roads may need to cross watercourses » Erosion and soil loss within **watercourses** » Negative impacts on **watercourses** » Disturbance to or loss of **watercourses** » Sedimentation of **watercourse areas** » Increased runoff into rivers can potentially be associated with accelerated erosion in **watercourses**	» Identify and demarcate construction areas for general construction work and restrict construction activity to these areas. Prevent unnecessary destructive activity within construction areas (prevent over-excavations and double handling) » Stockpile topsoil for re-use in rehabilitation phase. Maintain stockpile shape and protect from erosion. All stockpiles must be positioned at least 50m away from watercourses. Limit the height of stockpiles as far as possible in order to reduce compaction. » Disturbance of vegetation and topsoil must be kept to a practical minimum. » Rehabilitate disturbance areas as soon as construction in an area is completed with suitable means. » Any storm-water within the site must be handled in a suitable manner, i.e. trap sediments and reduce flow velocities. Any management actions must be dealt with in the SWMP typically submitted post authorisation, forming part of any WULA.	» No activity in identified no-go areas i.e. any aquatic area identified outside any proposed crossings or 32m buffer » No unacceptable levels of disturbance, soil erosion, increased siltation, soil degradation, as determined by the ECO » All excavations undertaken as per the approved Method Statement »	Holder of the EA	During site establishment, construction and operational phase

Construction and Operation Phase					
Objective	**Potential Impact**	**Mitigation Measures**	**Indicator/ Outcome**	**Responsibility**	**Timeframes**
Management of general solid waste, hazardous waste and liquid waste to mitigate environmental impacts.	» The construction phase and at time the operational phase of the wind energy facility may involve the storage and handling of a variety of chemicals including adhesives, abrasives, oils and lubricants, paints and solvents although in small amounts. The main wastes expected to be generated by the construction of the facility will include **general solid waste, hazardous waste and liquid waste**. » The watercourse areas could be impacted via: 1. Release of contaminated water from contact with spilled chemicals could impact the 2. Generation of contaminated wastes from used chemical containers	» Storage areas must be located more than 50 m away from the watercourse. » The storage of flammable and combustible liquids such as oils must be in designated areas which are appropriately bunded, and stored in compliance with MSDS files, as defined by the SHE Representative / ECO. » Any spills must receive the necessary clean-up action. If required, bioremediation kits are to be kept on-site and used to remediate any spills that may occur. Appropriate arrangements to be made for appropriate collection and disposal of all cleaning materials, absorbents and contaminated soils (in accordance with a waste management plan).	» No chemical spills outside of designated storage areas » No water or soil contamination by chemical spills » No complaints received regarding waste on site or indiscriminate dumping » Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately	Holder of the EA	During site establishment, construction and operational phase

	3. Inefficient use of resources resulting in excessive waste generation 4. Litter or contamination of the site or water through poor waste management practices	» Any storage and disposal permits/approvals which may be required will be obtained, and the conditions attached to such permits and approvals must be complied with. » Routine servicing and maintenance of vehicles is not to take place on-site (except for emergency situations 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. » Transport of all hazardous substances must be in accordance with the relevant legislation and regulations. » Waste disposal records must be available for review at any time. » Construction contractors must provide specific detailed waste management plans to deal with all waste streams. » 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. » 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). » Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors. » Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area. » 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. » Documentation (waste manifest) must be maintained detailing the quantity, nature and fate of any hazardous waste. » An incident/complaints register must be established and maintained on-site. » Hazardous and non-hazardous waste must be separated at source. Separate waste collection bins must be provided for this purpose. These bins must be clearly marked and appropriately covered. » All solid waste collected must be disposed of at a registered waste disposal site. A certificate of disposal must be obtained and kept on file. The disposal of waste must be in accordance with all relevant legislation. Under no	» Provision of all appropriate waste manifests for all waste streams » Designated areas for fires identified on site at the outset of the construction phase » Firefighting equipment and training provided before the construction phase commences » No activity in identified no-go areas » No unacceptable levels of disturbance, soil erosion, increased siltation, soil degradation, as determined by the ECO » All excavations undertaken as per the approved Method Statement »		

		circumstances may solid waste be burnt or buried on site. » Supply waste collection bins at construction equipment and construction crew camps. » Construction equipment must be refuelled within designated refuelling locations, or where remote refuelling is required, appropriate drip trays must be utilised. » All stored fuels to be maintained within a bund and on a sealed surface. » Fuel storage areas must be inspected regularly to ensure bund stability, integrity and function. » Construction machinery must be stored in an appropriately sealed area. » Oily water from bunds at the substation must be removed from site by licensed contractors. » Spilled cement or concrete must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site. » Corrective action must be undertaken immediately if a complaint is received, 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. » 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. » Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility. » Upon the completion of construction, the area will be cleared of potentially polluting materials. » Identify and demarcate construction areas for general construction work and restrict construction activity to these areas. Prevent unnecessary destructive activity within construction 7areas (prevent over-excavations and double handling) » Stockpile topsoil for re-use in rehabilitation phase. Maintain stockpile shape and protect from erosion. All stockpiles must be positioned at least 50 m away from watercourses. Limit the height of stockpiles as far as possible in order to reduce compaction. » Any excavation, including those for cables, must be supervised by the ECO/ESO within the proposed watercourses. Disturbance of vegetation and topsoil must be kept to a practical minimum. » Rehabilitate disturbance areas as soon as construction in an area is completed.			

11. Conclusion and Recommendations

The proposed layout for the Rondekop WEF was assessed has a limited impact on the aquatic environment as the proposed structures for the most part have either avoided the delineated watercourses except for existing access roads that will make use of existing roads crossing watercourses. The use of any existing roads and upgrading thereof will further support this conclusion. One wetland was found on Centre Ridge Road Alternative 1 by the Terrestrial Ecologist and thus this alternative 1 is no longer supported..

<u>Thus, based on the findings of this study no objection to the authorisation of any of the proposed activities inclusive of the alternatives, apart from Centre Ridge Road Alternative 1, is made.</u>

Where any road upgrades are required it is understood that these current crossings may be upgraded by increasing the current size of the culverts and providing additional erosion protection, thus a possible net benefit to the local aquatic systems may result. The actual requirements and designs will be finalized in the detail design phase. It is therefore recommended that these positions are assessed in the EMP walk down phase to provide detailed mitigations to the engineers as and when required.

Further, no <u>aquatic</u> protected or species of special concern (flora) were observed during the site visit.

Therefore, based on the site visit the significance of the impacts assessed for the aquatic systems after mitigation would be LOW.

Figure 7 above further indicates the affected watercourses and those that would trigger the need for a WULA (a potential GA) in terms of Section 21 c and i of the NWA 1998, should any construction take place within these areas.

Note the final number of actual water course crossings can be determined when micro-siting occurs, and the final roads layout has been defined as only 200 m roads corridor is known. This does however present an opportunity for the design team to use the buffer, to design the roads in such a manner to avoid these areas, thus minimising the number of WULAs required.

As the proposed activities have the potential to create erosion the following key recommendations and assumptions are reiterated:

- Vegetation clearing should occur in 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.
- All construction materials including fuels and oil should be stored in demarcated areas that are contained within berms / bunds to avoid spread of any contamination. Washing and cleaning of equipment should also be done in berms or bunds, to trap any cement and prevent excessive soil erosion. Mechanical plant and bowsers must not be refuelled or serviced within or directly adjacent to any channel. It is therefore suggested that all construction camps, lay down areas, batching plants or areas and any stores should be more than 50m from any demarcated watercourses.
- It is also advised that an Environmental Control Officer, with a good understanding of the local flora be appointed during the construction phase. The ECO should be able to make clear recommendations with regards to the re-vegetation of the newly completed / disturbed areas, using selected species detailed in this report.
- All alien plant re-growth must be monitored and should these alien plants reoccur these plants should be re-eradicated. The scale of the operation does however not warrant the use of a Landscape Architect and / or Landscape Contractor.

- No transmission line towers, substations and construction camps will be placed within the delineated watercourses as well as their respective buffers without obtaining the required approvals.
- It is further recommended that a comprehensive rehabilitation plan be implemented from the project onset within watercourse areas (including of buffers) to ensure a net benefit to the aquatic environment. This should from part of the suggested walk down as part of the final EMP preparation

Table 4 below summarises the various alternatives in respect of any preference, although except for the two Construction camps (1 & 5) all sites / roads will either avoid the watercourses including 32m buffer or make use of existing tracks or roads.

12. References

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National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended.

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Pool-Stanvliet, R., Duffell-Canham, A., Pence, G. & Smart, R. 2017. The Western Cape Biodiversity Spatial Plan Handbook. Stellenbosch: CapeNature.

13. Appendix 1 - Specialist CV

CURRICULUM VITAE
Dr Brian Michael Colloty
7212215031083

1 Rossini Rd
Pari Park
Port Elizabeth, 6070
brian@itsnet.co.za
083 498 3299

Profession: Ecologist & Environmental Assessment Practitioner (Pr. Sci. Nat. 400268/07 & EAPSA certified). Member of the South African Wetland Society
Specialisation: Ecology and conservation importance rating of inland habitats, wetlands, rivers & estuaries
Years experience: 21 years

SKILLS BASE AND CORE COMPETENCIES
- 21 years experience in environmental sensitivity and conservation assessment of aquatic and terrestrial systems inclusive of Index of Habitat Integrity (IHI), WET Tools, Riparian Vegetation Response Assessment Index (VEGRAI) for Reserve Determinations, estuarine and wetland delineation throughout Africa. Experience also includes biodiversity and ecological assessments with regard sensitive fauna and flora, within the marine, coastal and inland environments. Countries include Mozambique, Kenya, Namibia, Central African Republic, Zambia, Eritrea, Mauritius, Madagascar, Angola, Ghana, Guinea-Bissau and Sierra Leone. Current projects also span all nine provinces in South Africa.
- 12 years experience in the coordination and management of multi-disciplinary teams, such as specialist teams for small to large scale EIAs and environmental monitoring programmes, throughout Africa and inclusive of marine, coastal and inland systems. This includes project and budget management, specialist team management, client and stakeholder engagement and project reporting.
- GIS mapping and sensitivity analysis

TERTIARY EDUCATION
- 1994: B Sc Degree (Botany & Zoology) - NMMU
- 1995: B Sc Hon (Zoology) - NMMU
- 1996: M Sc (Botany - Rivers) - NMMU
- 2000: Ph D (Botany – Estuaries & Mangroves) – NMMU

EMPLOYMENT HISTORY
- 1996 – 2000 Researcher at Nelson Mandela Metropolitan University – SAB institute for Coastal Research & Management. Funded by the WRC.
- 2001 – January 2003 Training development officer AVK SA (reason for leaving – sought work back in the environmental field rather than engineering sector)
- February 2003- June 2005 Project manager & Ecologist for Strategic Environmental Focus (Pretoria) – (reason for leaving – sought work related more to experience in the coastal environment)
- July 2005 – June 2009 Principal Environmental Consultant Coastal & Environmental Services (reason for leaving – company restructuring)
- June 2009 – present Owner / Ecologist of Scherman Colloty & Associates cc

SELECTED RELEVANT PROJECT EXPERIENCE
World Bank IFC Standards
- Kenmare Mining Pilivilli, Mozambique - wetland (mangroves, peatlands and estuarine) assessment and biodiversity offset analysis - current
- Botswana South Africa 400kv transmission line (400km) biodiversity assessment on behalf of Aurecon - current
- Farim phosphate mine and port development, Guinea Bissau – biodiversity and estuarine assessment on behalf of Knight Piesold Canada – 2016.
- Tema LNG offshore pipeline EIA – marine and estuarine assessment for Quantum Power (2015).
- Colluli Potash South Boulder, Eritrea, SEIA marine baseline and hydrodynamic surveys co-ordinator and coastal vegetation specialist (coastal lagoon and marine) (on-going).
- Wetland, estuarine and riverine assessment for Addax Biofeuls Sierra Leone, Makeni for Coastal & Environmental Services: 2009
- ESHIA Project manager and long-term marine monitoring phase coordinator with regards the dredge works required in Luanda bay, Angola. Monitoring included water quality and biological changes in the bay and at the offshore disposal outfall site, 2005-2011

South African
- Wetland specialist appointed to update the Eastern Cape Biodiversity Conservation Plan, for the Province on behalf of EOH CES appointment by SANBI – current. This includes updating the National Wetland Inventory for the province, submitting the new data to CSIR/SANBI.

- Nelson Mandela Bay Municipality Baakens River Integrated Wetland Assessment (Inclusive of Rehabilitation and Monitoring Plans) for CEN IEM Unit - Current
- Rangers Biomass Gasification Project (Uitenhage), wetland assessment and wetland rehabilitation / monitoring plans for CEM IEM Unit – current.
- Gibson Bay Wind Farm implementation of the wetland management plan during the construction and operation of the wind farm (includes surface / groundwater as well wetland rehabilitation & monitoring plan) on behalf of Enel Green Power - current
- Gibson Bay Wind Farm 133kV Transmission Line wetland management plan during the construction of the transmission line (includes wetland rehabilitation & monitoring plan) on behalf of Eskom – 2016.
- Tsitsikamma Community Wind Farm implementation of the wetland management plan during the construction of the wind farm (includes surface / biomonitoring, as well wetland rehabilitation & monitoring plan) on behalf of Cennergi – completed May 2016.
- Alicedale bulk sewer pipeline for Cacadu District, wetland and water quality assessment, 2016
- Mogalakwena 33kv transmission line in the Limpopo Province, on behlaf of Aurecon, 2016
- Cape St Francis WWTW expansion wetland and passive treatment system for the Kouga Municipality, 2015
- Macindane bulk water and sewer pipelines wetland and wetland rehabilitation plan for the Indwe 2015
- Eskom Prieska to Copperton 132kV transmission line aquatic assessment, Northern Cape on behalf of Savannah Environmental 2015.
- Joe Slovo sewer pipeline upgrade wetland assessment for Nelson Mandela Bay Municipality 2014
- Cape Recife Waste Water Treatment Works expansion and pipeline aquatic assessment for Nelson Mandela Bay Municipality 2013
- Pola park bulk sewer line upgrade aquatic assessment for Nelson Mandela Bay Municipality 2013
- Transnet Freight Rail – Swazi Rail Link (Current) wetland and ecological assessment on behalf of Aurecon for the proposed rail upgrade from Ermelo to Richards Bay
- Eskom Transmission wetland and ecological assessment for the proposed transmission line between Pietermaritzburg and Richards Bay on behalf of Aurecon (2012).
- Port Durnford Exarro Sands biodiversity assessment for the proposed mineral sands mine on behalf of Exxaro (2009)
- Fairbreeze Mine Exxaro (Mtunzini) wetland assessment on behalf of Strategic Environmental Services (2007).
- Wetland assessment for Richards Bay Minerals (2013) – Zulti North haul road on behalf of RBM.
- Biodiversity and aquatic assessments for 85 renewable projects in the past four years in the Western, Eastern, Northern Cape, KwaZulu-Natal and Free State provinces. Clients included RES-SA, RedCap, ACED Renewables, Mainstream Renewable, GDF Suez, Globeleq, ENEL, Abengoa amongst others. Particular aquatic sensitivity assessment and Water Use License Applications on behalf of Mainstream Renewable Energy (8 wind farms and 3 PV facilities.), Cennergi / Exxaro (2 Wind farm), WKN Wind current (2 wind farms & 2 PV facilities), ACED (6 wind farms) and Windlab (3 Wind farms) were also conducted. Several of these projects also required the assessment of the proposed transmission lines and switching stations, which were conducted on behalf of Eskom.
- Vegetation assessments on the Great Brak rivers for Department of Water and Sanitation, 2006 and the Gouritz Water Management Area (2014)
- Proposed FibreCo fibre optic cable vegetation assessment along the N2, PE to Cape Town, 2012 on behalf of SRK (2013).

Appendix 6C

Avifaunal Assessment

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SOUTH AFRICA

Prepared for:

SiVEST | Environmental Division

ADDENDUM

AVIFAUNAL SPECIALIST STUDY

Impact Assessment for the proposed 325MW Rondekop Wind Energy Facility (WEF), between Matjiesfontein and Sutherland in the Northern Cape Province (DEA REF: 14/12/16/3/3/2/1115)

February 2019

LOOKING DEEP INTO NATURE

Statement

The proposed Rondekop Wind Energy Facility (hereafter referred to as "Rondekop WEF"), is located approximately 45km southwest of Sutherland in the Northern Cape Province (Figure 1).

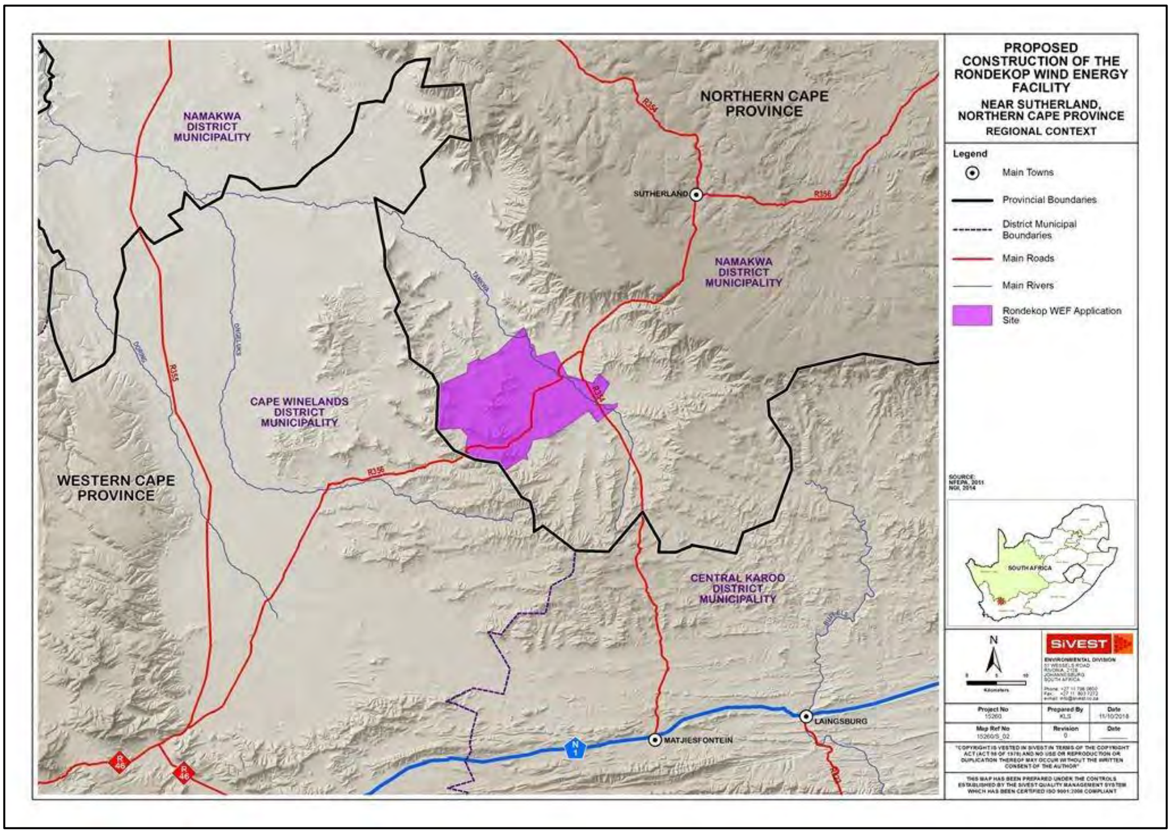

Figure 1 - Location of the proposed Rondekop WEF (Image provided by SiVEST).

In February 2019, Bioinsight delivered an avifaunal specialist impact assessment report (Bioinsight, 2019), providing the general results of the 1-year pre-construction monitoring campaign, as well as defining clear sensitivity areas for the bird community expected to occur on site, and giving inputs into the authorisation process and requirements for future project phases. The monitoring campaign was conducted in full compliance with the bird monitoring guidelines applicable at the time (Jenkins, et al., 2015).

However, after the submission of this document, some minor turbine specification and general layout changes have been proposed for the development. As such, SiVEST (on behalf of G7 Renewable Energies (Pty) Ltd.) have requested Bioinsight (Pty) Ltd. to conduct a desktop level assessment on the updated layout & specification changes to the project and to determine whether or not these changes are acceptable and implementable in terms of the bird community and bird sensitive areas on site. The changes assessed are presented below in Table 1:

Table 1 - List of updated layout & specification changes for Rondekop WEF.

Revised layout/specification changes	Reason for changes
Slight alignment shifts of turbines 16 & 44	Turbine 16 requested to be shifted in Ecology report, while turbine 44 requested to be shifted in Bird & Bat reports.
Minor alignment changes of turbine 25 access road to crane pad	Previous alignment very close to the edge of the ridge (potential downslope erosion).
Minor alignment shift to turbine 27 access road	To avoid crossing a rocky ridge / outcrop.
Minor alignment change to road between turbines 28 & 29	To avoid rocky outcrop.
Minor alignment changes to crane pads 29 & 35	To avoid rocky outcrops.
Shifted alignment of Access Road North 1	To move it further away from the drainage line and to allow it to cross this line perpendicularly at a single point.
Shifted Access Road 2	To only cross the drainage line at a single point.
Shift of construction camp 1	To follow road alignment.
Turbine capacity change from between 3MW and 6.5MW to up to 8MW	-

Updated layout changes

Upon analysis of the revised layout versus the sensitivity mapping of the site, it was observed that all wind turbine locations (including the 90m impact zone around each turbine) are avoiding very high sensitivity (no-go) areas (Figure 2). This includes the previously identified (Bioinsight, 2019) overlap of the turbine 44 impact zone with a demarcated no-go area of an established drainage line. The newly revised layout rectifies this problem and an acceptable alternative has been produced (Figure 3).

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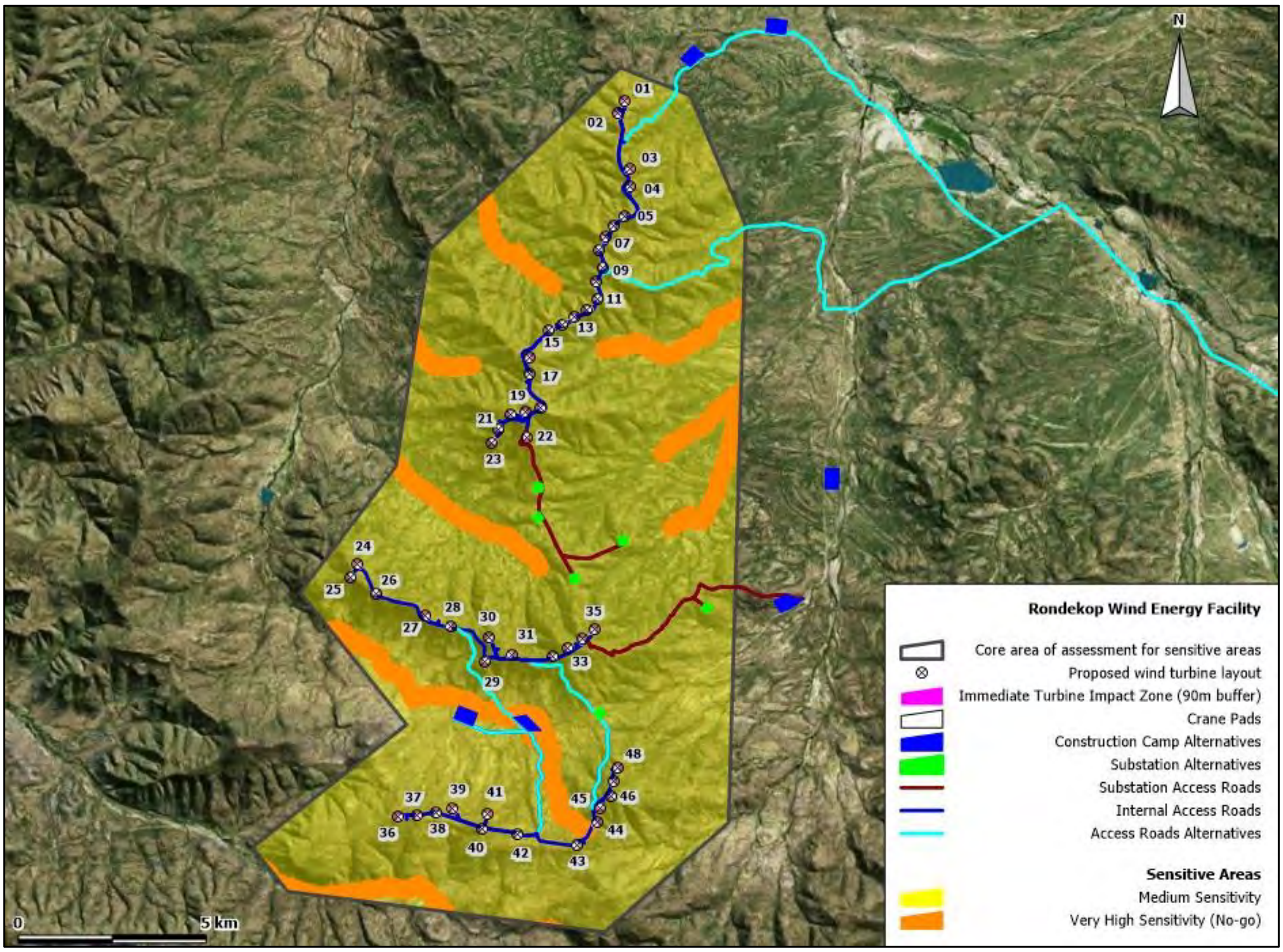

Figure 2 - Updated infrastructure layout relative to sensitivity mapping for the Rondekop WEF bird community.

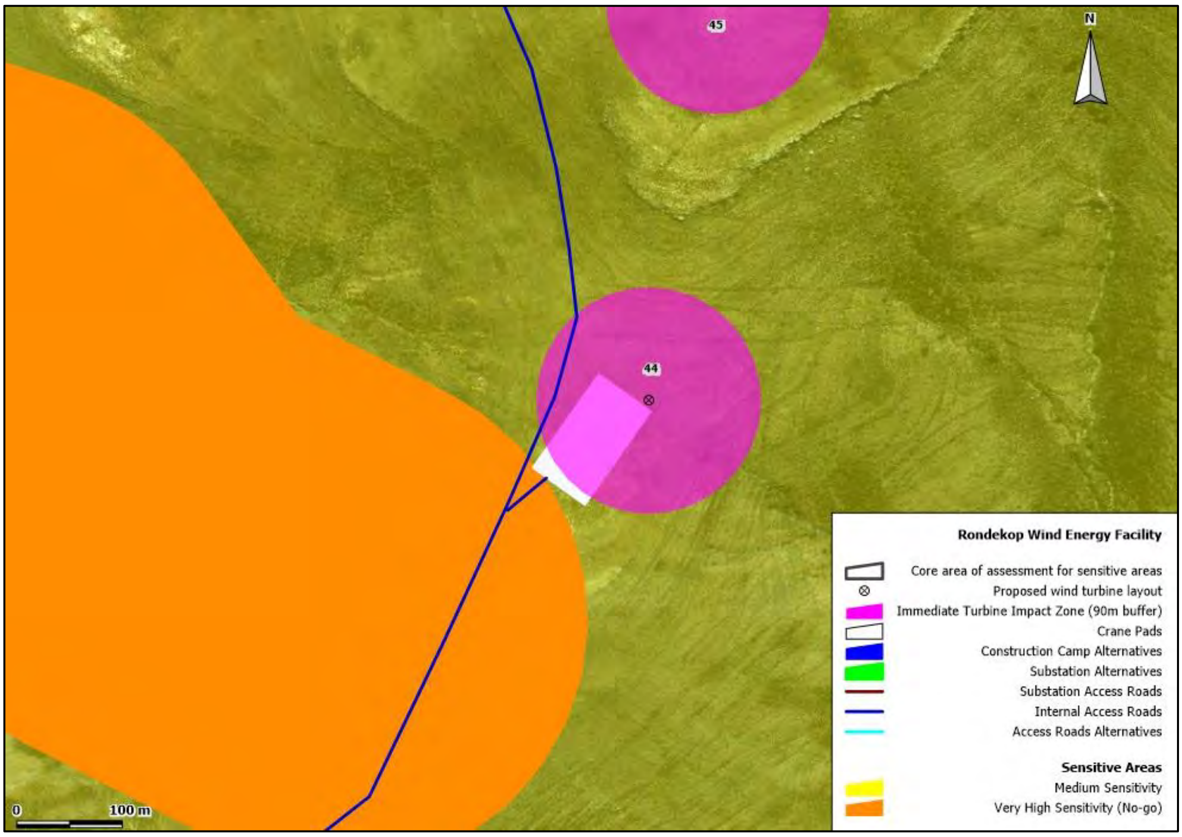

Figure 3 - Acceptable relocation of Turbine 44 and associated impact zone out of the previously identified no-go area.

Additionally, almost all associated infrastructures are also situated outside of no-go areas – with the exception of some construction camp & access road alternatives. Both of these infrastructure types can be seen intercepting a no-go buffer around an identified drainage line. However, it must be noted that the internal access routes that cross the no-go areas are currently designed to be crossing at a relatively perpendicular angle, and as such, any potential impacts are not expected to be of a significant concern – as the affected area is very limited. Similarly, as construction camps are only temporary structures that will be removed once the wind farm construction has completed, it is not suspected that the day-time activities of these features will cause significant disturbance to the bird community on site. Therefore, even though these specific identified roads and construction camps are 'least preferred' infrastructures (relative to their more suited counterparts), their construction is still considered acceptable with the implementation of mitigation strategies (Bioinsight, 2019).

Updated turbine specification changes

It is noted and confirmed that the turbine capacity specifications have been updated to have a capacity of up to 8MW per turbine, as opposed to the previously assessed 3MW – 6.5MW. In terms of the bird community on site, this change holds no significance – as long as the rotor diameter and hub height specifications remain unchanged to that which has been previously assessed in the final bird impact assessment report (Bioinsight, 2019). If such changes were to occur, then the potential impacts would need to be re-assessed accordingly.

However, it has since been confirmed that the turbine hub & rotor diameter specifications will remain the same (as previously assessed), and that it is only the generating capacity (per turbine) that will undergo changes. Therefore, the increase in this turbine capacity is considered acceptable for the bird community on site.

CONCLUSION

It can be concluded that in the compilation of this addendum, all reviewed layout & specification changes (as listed in table 1) have been adequately assessed in relation to the bird community on site. It is the specialist's opinion that all proposed changes of relevant infrastructures for the Rondekop Wind Energy Facility will not be significantly different to that which was considered in the final Avifaunal Impact Assessment Report (Bioinsight, 2019), and none of these changes will be to the detriment of the bird community occurring on site. If the proposed mitigation measures (Bioinsight, 2019) are implemented and adhered to for the project, then it is not considered to cause irreplaceable loss of bird biodiversity. As such, the overall impact rating reflected in the Avifaunal Impact Assessment Report (Bioinsight, 2019) will remain unchanged. **No fatal flaws were identified for the project and the final layout & turbine specifications are considered acceptable and implementable in it's updated format.**

22nd February 2019

on Behalf of Bioinsight (Pty) Ltd

Craig Campbell

BSc in Conservation Ecology

Miguel Mascarenhas

MSc in Environmental Impact Assessments

BSc in Applied Biology for Plant Resources

Registered Professional Natural Scientist

Ecological Sciences (400168/14)

References

Bioinsight. (2019). *Avifaunal Impact Assessment for the Proposed Development of the 325MW Rondekop Wind Energy Facility and associated infrastructure, between Matjiesfontein and Sutherland in the Northern Cape Province: IA Report.* Cape Town.

Jenkins, A., van Rooyen, C., J.J, S., Harrison, J., Diamond, M., Smit-Robinson, H., & Ralston, S. (2015). *Best-Practice Guidelines for assessing and montiroing the impact of wind-energy facilities on birds in southern Africa (Third Edition).* Cape Town: Birdlife South Africa & Endangered Wildlife Trust.

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AVIFAUNAL IMPACT ASSESSMENT BASED ON 12 MONTH PRE-CONSTRUCTION MONITORING CAMPAIGN TO INFORM THE IMPACT ASSESSMENT:

Impact Assessment for the Proposed Development of the 325MW Rondekop Wind Energy Facility and associated infrastructure, between Matjiesfontein and Sutherland in the Northern Cape Province: IA REPORT

Report prepared for:

SiVEST – Environmental Division

La Lucia Ridge Office Estate

4 Pencarrow Crescent, Durban 4320

South Africa

Report prepared by:

Bioinsight (Pty) Ltd.

Unit 306, Warwick Place

Grand National Boulevard, Milnerton 7441

South Africa

22nd February 2019

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SOUTH AFRICA

SPECIALIST EXPERTISE

The Avifaunal Specialist, Miguel Mascarenhas (Pri.Sci.Nat), serves as an independent specialist and is professionally registered with the South African Council for Natural Scientific Professions (Registration: Professional in Ecological Sciences, 400168/14). His short CV detailing a portion of his recent work and publications in 2018 is presented below. A full CV can be provided upon request.

—— MIGUEL MASCARENHAS ——

Profile

Miguel Mascarenhas is a Manager and an Ecological Environmental specialist that likes challenges, innovation and be a solution designer. As a consequence, at Bioinsight, Miguel assumes the role of business developer focused on leading a highly motivated team that also loves to be challenged, whether by complex project or the development of disruptive solutions.

Experience:

16 years | 648 proj.

Worked in countries:
- Portugal
- Mozambique

Projects for countries:
- South Africa
- Cape Verde
- Mexico
- Mozambique
- Poland
- Portugal

Skills

Corporate management
●●●●●
Environmental Impact
●●●●○
Ecology
●●●●○

+ Employment

CHAIRMAN OF THE BOARD | BIODINÂMICA, MOZAMBIQUE
Since 2017

SENIOR CONSULTANT | BIO3 LDA., PORTUGAL
2012 - 2016

CEO AND BUSINESS DEVELOPMENT DIRECTOR | BIO3 LDA., PORTUGAL
2011 - 2012

CEO | BIOINSIGHT (BIO3), PORTUGAL
Since 2011

CEO | BIO3 LDA., PORTUGAL
2005 - 2011

CEO | BIO3 LDA., PORTUGAL
2005 - 2013

FREELANCER | SEVERAL COMPANIES SUCH AS DHVFBO, ENERPRO, PROCESL E PGG, PORTUGAL
2003 - 2005

RESEARCHER | LABORATÓRIO DE BIOLOGIA CELULAR - INSTITUTO DE BIOLOGIA EXPERIMENTAL E TECNOLÓGICA, PORTUGAL
2002 - 2003

+ Education

MSC IN BUSINESS MANAGEMENT (EQF LEVEL 7)
INDEG Business School, Portugal
2011 - 2013

POS-GRADUATION IN GEOGRAPHIC INFORMATION SYSTEMS
Higher Institute of Agronomy, Portugal
2006 - 2006

MSC IN ENVIRONMENTAL IMPACT ASSESSMENT (EQF LEVEL 7)
Institute of Ecology Investigation of Málaga, Spain
2003 - 2004

GRADUATION IN APPLIED PLANTS BIOLOGY (EQF LEVEL 6)
Sciences Faculty of the University of Lisbon, Portugal
1995 - 2001

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+ Projects

Bioinsight projects

2018	Nature Conservation	Ecological Component of the Environmental Incidence Assessmen of na Aviary in Évora, Portugal. Portugal.
2018	Tourism&Urban Areas	Ecological Component of the Environmental Incidence Assessmen of an Execution Project for the Eletrification of the section Marco de Canaveses - Régua da Linha do Douro, Portugal. Portugal.
2018	Nature Conservation	Characterization of Flora and Vegetation of a Rural Hotel in Herdade da Comporta, Portugal. Portugal.
2018	Wind Energy	Ecological Component of the Environmental Impact Assessmen of Arrimal's Wind Farm, Portugal. Portugal.
2018	Wind Energy	Annual Monitoring Study of Birds and Bats (daytime and nightime) in 2018 in the Park and in the Eletric Line of Bii Stinu Wind Farm (EDI), Oaxaca, Mexico. Mexico.
2018	Oil & Gas	Ecological Monitoring of the Construction of the Replacement Village (RV) Ecological Monitoring of a Replacement Village Project associated to the development of a Liquefied Natural Gas Project of Anadarko Moçambique Area 1 Limitada (AMA 1) in Palma. Mozambique.
2018	Mines	Ecological Component of the Environmental Impact Assessmen of an Mining Instalation enlargement in Aljustrel, Portugal. Portugal.
2018	Hidric Energy	Ecological and climate componente of a Special Program for Ribeiradio-Ermida Dam, Portugal. Portugal.
2018	Electric Sector	Ecological Component of the Environmental Impact Assessmen of a substation of an Electric Energy Transformation - Tabaqueira, Portugal. Portugal.
2018	Wind Energy	Environmental Report for legal framework apllication to APA on the Overcapacity Equipment in Archeira Wind Farm, Portugal. Portugal.

+ Publications

2018	Book Chapter | Wind energy Impacts	Santos, J., Marques, J., Neves, T., Marques, A.T., Ramalho, R., Mascarenhas, M. (2018). Environmental Impact Assessment Methods: An Overview of the Process for Wind Farm's Different Phases – From Pre-Construction to Operation. In: Mascarenhas, M., Marques, A.T., Ramalho, R., Santos, D., Bernardino, J., Fonseca, C. (Eds). Biodiversity and Wind Farms in Portugal: Current Knowledge and Insights for an Integrated Impact Assessment Process, pp. 35-86. Springer International Publishing.
2018	Book Chapter | Wind energy impacts	Rodrigues, S. , Rosa, L., Mascarenhas, M. (2018). An Overview on Methods to Assess Bird and Bat Collision Risk in Wind Farms. In: Mascarenhas, M., Marques, A.T., Ramalho, R., Santos, D., Bernardino, J., Fonseca, C. (Eds). Biodiversity and Wind Farms in Portugal, pp. 87-110. Springer International Publishing.
2018	Book Chapter | Wind energy impacts	Marques, J., Rodrigues, S., Ferreira, R., Mascarenhas, M. (2018). Wind Industry in Portugal and Its Impacts on Wildlife: Special Focus on Spatial and Temporal Distribution on Bird and Bat Fatalities. In: Mascarenhas, M., Marques, A.T., Ramalho, R., Santos, D., Bernardino, J., Fonseca, C. (Eds). Biodiversity and Wind Farms in Portugal, pp. 1-22. Springer International Publishing.
2018	Book Chapter | Wind energy Impacts	Paula, J., Augusto, M., Neves, T., Bispo, R., Cardoso, P., Mascarenhas, M. (2018). Comparing Field Methods Used to Determine Bird and Bat Fatalities. In: Mascarenhas, M., Marques, A.T., Ramalho, R., Santos, D., Bernardino, J., Fonseca, C. (Eds). Biodiversity and Wind Farms in Portugal. Springer International Publishing.
2018	Book chapter | Wind energy impacts	Coelho, H., Mesquita, S., Mascarenhas, M. (2018). How to Design an Adaptive Management Approach? In: Biodiversity and Wind Farms in Portugal - Current knowledge and insights for an integrated impact assessment process. Editors: Mascarenhas, M., Marques, A.T., Ramalho, R., Santos, D., Bernardino, J., Fonseca, C. (Eds.). Chapter 8 - Pages 205-224. Springer Book.
2017	Oral Presentation | Statistics & Ecology	Cláudio, N., Rodrigues, S., Mascarenhas, M., Mouriño, H., Marques, T.A. (2017). Classificação automática de sons de morcegos [Automatic identification of bat sounds]. Congresso da Sociedade Portuguesa de Estatística. 18 to 21 de October 2017. Lisbon, Portugal.[in Portuguese]
2017	Oral presentation | Wind energy impacts	Coelho, H., McLean, N., Mascarenhas, M., Pendlebury, C. (2017). Experiences gained from delivery of offshore wind energy in the UK that could inform the environmental assessment of Portuguese projects. 4th Conference on Wind energy and Wildlife impacts (CWW). 6 to 8 September 2017. Estoril, Portugal.
2017	Poster | Wind energy Environ. Assessment	Mascarenhas, M., Coelho, H., Sá da Costa, A. (2017). Wind farms aren't the same concept to all of us? So what are they? 4th Conference on Wind energy and Wildlife impacts (CWW). 6 to 8 september 2017. Estoril, Portugal.
2017	Poster | Wind energy Environ. Assessment	Tidhar, D., Mascarenhas, M., Coelho, H., McLean, N. (2017). How to reduce uncertainty using a question based approach for universal wind energy assessment. 4th Conference on Wind energy and Wildlife impacts (CWW). 6 to 8 september 2017. Estoril, Portugal.
2017	Poster | Wind energy impacts	Mesquita, S., Coelho, H., Mascarenhas, M. (2017). Adding value to wind farm projects by integrating ecosystem services in the environmental impact assessment process. 4th Conference on Wind energy and Wildlife impacts (CWW). 6 to 8 september 2017. Estoril, Portugal.

SPECIALIST DECLARATION

I, **Miguel Rodolfo Teixeira de Mascarenhas**, as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- I act as the independent specialist in this application;
- I perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have no vested interest in the proposed activity proceeding;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist: Miguel Rodolfo Teixeira de Mascarenhas

Name of Specialist: Miguel Rodolfo Teixeira de Mascarenhas

Date: 11th December 2018

EXECUTIVE SUMMARY

Rondekop Wind Energy Facility (WEF) is a proposed 325 MW wind farm development planned at approximately 45 km southwest of Sutherland, in the Northern Cape Province. Bioinsight (Pty) Ltd. (hereafter referred to as 'Bioinsight') was appointed to undertake and finalise the 12-month bird pre-construction monitoring programme in accordance with the best practice pre-construction monitoring guidelines (Jenkins *et al.*, 2015). Bioinsight was also appointed to undertake the bird specialist study for the Impact Assessment for the proposed Rondekop WEF.

The study area is characterised by accentuated mountainous areas with vegetation adapted to the semi-arid conditions and harsh rocky conditions. Currently, the area where Rondekop WEF is proposed shows no signs of intense disturbance. The area is logistically very difficult for human access and therefore remains in almost pristine natural conditions, apart from the general impacts on the veld caused by grazing and a three-year drought period.

During the 12 months of pre-construction bird monitoring at the site, several methodologies were implemented to study the local bird communities and inform the assessment of potential risks from the construction and operation of the proposed project. The following techniques were applied at the proposed WEF area and its immediate surroundings: a desktop and bibliographic review, walked and vehicle based transects, vantage point monitoring, incidental observations and waterbody and breeding evidence surveys.

Site visits confirmed the occurrence of relatively high abundances of *Accipitrid* and *Falcon* species. The results have shown that both groups have a constant presence at the site throughout the year and spend a high proportion of their time and/or number of contacts at rotor height in comparison with the other groups of species. It is also noteworthy that their activity was especially associated with the hillside and escarpment areas, where most of the potential collision risk movements (flight at potential rotor height depending on the turbine specifications) were observed. A total of eight species confirmed in the area may be of special concern for having an unfavourable conservation status in South Africa: Black Harrier *Circus maurus*, Ludwig's Bustard *Neotis ludwigii*, Martial Eagle *Polemaetus bellicosus* – Endangered; Black Stork *Ciconia nigra*, Verreauxs' Eagle *Aquila verreauxii* – Vulnerable; Karoo Korhaan *Eupodotis vigorsii*, Maccoa Duck *Oxyura maccoa*, Greater Flamingo *Phoenicopterus roseus* – Near Threatened.

Sensitive areas identified at the proposed site considered the relevant aspects collected through the bird monitoring programme, including: relevant activity of sensitive species and associated potential for collision recorded in areas of hillsides and escarpments; particular association of passerine species and other relevant sensitive species to riverine thickets and water features; association of red-listed species with their potential breeding/roosting locations onsite and in the greater surrounds. This allowed for establishment of avoidance areas (areas with very high sensitivity for birds).

The main direct impacts identified to potentially occur are: increased habitat loss, increased fatalities due to collision with various project infrastructures, and increased disturbance/displacement effects. The overall significance of these impacts expected to occur during the construction, operation, and decommissioning phases, is expected to be <u>medium</u> before mitigation, and <u>low</u> after mitigation – as seen in the summary table below.

Environmental parameter	Issues	Rating prior to mitigation	Average	Rating post mitigation	Average
Habitat loss (construction phase)	Destruction of habitat areas due to the construction of wind turbines & associated infrastructures	-24		-16	
Disturbance / Displacement (construction phase)	Disturbance / displacement of the bird community due to the increase of people & vehicles in the area	-30		-18	
Fatalities due to collision (operational phase)	Fatalities due to collision with wind turbine blades or associated infrastructures	-45		-22	
Disturbance / Displacement (operational phase)	Disturbance / displacement of the bird community due to noise and movement generated by turbines and people / vehicles operating in the area	-30		-18	
Disturbance / Displacement (decommissioning phase)	Disturbance / displacement of the bird community due to the increase of people and vehicles in the area, when dismantling wind turbines and associated infrastructures	-22		-14	
			- 30.2		**-17.6**
			Medium Negative Impact		**Low Negative Impact**

Cumulative impacts were assessed by adding expected impacts from the Rondekop WEF to existing and proposed wind energy developments with similar impacts, within a 50 km radius. It is however important to note that the quantification or even evaluation of cumulative impacts is uncertain as there is not a generalised knowledge of large-scale movements or connection between bird populations within the region. The overall significance of cumulative impacts expected to occur is estimated to be medium before mitigation, and low after mitigation.

No-go Alternative:

Should the Rondekop Wind Farm not be constructed, then all impacts (whether it be negative or positive) identified within the impact analysis will not take place. As a result, it is expected that the present environmental characteristics relevant for the bird community on site will remain unchanged, relative to that which is being observed at present (no significant impact on birds), under current land-use practices.

Rondekop WEF **is considered to be located in an area of medium bird sensitivity with some habitat features of high sensitivity in terms of the bird community** present. Impacts may be magnified due to cumulative impacts caused by other wind energy developments proposed in the area. Nonetheless, it is considered that although impacts cannot be totally eliminated, they can be minimised to the maximum extent possible, mostly through the **avoidance of very high sensitivity areas (i.e. no-go areas)**, and with the implementation of mitigation measures for areas of **medium sensitivity**.

It is also recommended that a construction and operational phase bird monitoring programme is implemented in line with the best practice monitoring guidelines to confirm and determine the extent of the impacts predicted as well as to validate the success of the mitigation strategies proposed. The preferred associated infrastructure layout alternatives are as follows: Access Road Alternative North 1 or 2, Access Road Alternative Centre 1 (or 2 with mitigation), Access Road Alternative South 1 (or 2 with mitigation), Construction Camps 1-4, Substations 1-6. It is in the opinion of the specialist that from an avifaunal perspective the proposed Rondekop WEF can be authorised, provided that the recommendations and mitigation measures outlined in this specialist impact assessment report are adhered to.

LIST OF ABBREVIATIONS

BA	Basic Assessment
BACI	Before-After Control-Impact Analysis
CITES	The Convention on International Trade in Endangered Species of Wild Fauna and Flora
CO	Control
DEA	Department of Environmental Affairs
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
GIS	Geographic Information System
IA	Impact Assessment
IBA	Important Bird Area
IUCN	Internal Union for Conservation of Nature (Global conservation status)
PVSEF	Photo Voltaic Solar Energy Facility
SA	South Africa
WEF	Wind Energy Facility

GLOSSARY

Definitions	
Cut-in wind speed	The lowest wind speed at hub height at which the wind turbine starts to produce power.
Endemic species	Species that are restricted to southern Africa.
Fatal Flaw	A major defect or deficiency in a project proposal that should result in an Environmental Authorisation being refused.
Red data species	A list of international (IUCN) as well as southern African threatened species.
Sensitive species	Species that aggregate a set of characteristics (higher risk of collision with wind turbines, specific habitat or ecological requirements, etc) and that are prone to be most affected by the project development.

COMPLIANCE WITH THE APPENDIX 6 OF THE 2014 EIA REGULATIONS

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Addressed in the Specialist Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Yes Pages i-ii
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Yes Page iii and external submission
c) an indication of the scope of, and the purpose for which, the report was prepared;	Yes Section 1.1.1
(cA) an indication of the quality and age of base data used for the specialist report;	Yes Section 1.1.5
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Yes Section 1.6
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Yes Section 1.1.3
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Yes Section 1.1.3
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Yes Section 1.2, 1.3 & 1.9
g) an identification of any areas to be avoided, including buffers;	Yes Section 1.3
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Yes Section 1.3
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Yes Section 1.1.4
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment or activities;	Yes Section 1.6 & 1.9
k) any mitigation measures for inclusion in the EMPr;	Yes Section 1.8 & 1.9
l) any conditions for inclusion in the environmental authorisation;	Yes Section 1.8 & 1.9
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Yes Section 1.8 & 1.9
n) a reasoned opinion- i. as to whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Yes Section 1.9
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
q) any other information requested by the competent authority.	N/A
2) Where a government notice *gazetted* by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A

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1 AVIFAUNAL IMPACT ASSESSMENT

1.1 INTRODUCTION AND METHODOLOGY

1.1.1 Scope and Objectives

The main objective of the pre-construction bird monitoring programme was to characterise the bird community present in the area and provide baseline information to assess bird habitat use in a pre-impact scenario, and to further inform the evaluation of the potential impacts caused by the proposed Rondekop Wind Energy Facility (WEF) (such as bird collision mortality, displacement due to disturbance, barrier effects and habitat loss) (Drewitt & Langston, 2006) and to consider and propose suitable mitigation measures. The specific objectives of the Bird Impact Assessment are to:

a) Establish the pre-impact baseline reference and characterisation of the bird communities occurring within the development area;

b) Identify the bird species or groups more susceptible to potential impacts (displacement and/or collision) during the construction and operation phase of the wind energy facility;

c) Identify the project elements more likely to produce impacts on the avifauna and/or habitats during and after construction;

d) Evaluate potential changes in the way sensitive species, and the general bird community, will use the wind energy facility site during the construction and operational phases;

e) Assess and map the collision risk for sensitive species. Outline sensitive areas and/or No-Go areas if necessary;

f) Propose measures to avoid or, if unavoidable, mitigate, compensate and monitor, identified potential impacts; and

g) Present the information in a logical manner to inform the authorities and key stakeholders.

In order to achieve the objectives of the pre-construction bird monitoring programme, an experimental protocol was established, covering the WEF site, its immediate surroundings and a Control (CO) area. This pre-construction bird monitoring programme was based on extensive experience in bird and wind farm monitoring and was designed in order to comply with the key requirements of the "Best- Practice Guidelines for assessing and monitoring the impact of wind-energy facilities on birds in southern Africa" (Jenkins *et al*., 2015). This programme entails the implementation of standardised study methods before, during and after construction, in the area of the proposed WEF, its immediate surroundings and a CO area Before-After Control-Impact (BACI) Analysis as proposed by national and international references (such as SNH 2009; Atienza *et al*. 2011; Strickland *et al*. 2011; Jenkins *et al*. 2012; USFWS 2012).

Although the general bird community was surveyed, the experimental protocol was specially directed to a set of 25 species considered to be sensitive to wind energy development impacts (hereafter simply referred to as sensitive species), 11 of which are Accipitrids, Falcons and similar, 8 are Large Terrestrial Birds and 6 are Passerine and other small terrestrial birds (

Table 1). These species were selected considering those identified as target species throughout the monitoring campaign (Bioinsight, 2018); species considered as priority for inclusion in studies considering wind farms (Retief *et al*., 2012) and lastly species considered prone to impacts caused by WEFs.

Table 1 - Sensitive bird species considered central to the avian impact assessment process for the proposed Rondekop WEF. Global RLCS (WW) (Red List Conservation Status) (IUCN 2016) and South Africa RLCS (SA) (Taylor, Peacock & Wanless 2015): EN – Endangered; VU – Vulnerable; NT – Near threatened; LC – Least Concern; NA – Not Assessed; Endemism in South Africa (BLSA 2016): * – endemic; (*) – near-endemic; SLS – endemic to South Africa, Lesotho and Swaziland. Likely Impacts: C – Collision; D – Disturbance and/or Displacement; H – Habitat destruction.

Group	Common Name	Scientific Name	Red List Conservation Status	Global Red List Conservation	Convention Migratory Species	Endemic to South Africa	Population Trend	Priority species	Likely Impacts
“Ciconids”	Hamerkop	*Scopus umbretta*	-	LC	-	-	Stable	X	D
“Ciconids”	Black Stork	*Ciconia nigra*	VU	LC	II	-	Unknown	X	C, D
“Ciconids”	African Sacred Ibis	*Threskiornis aethiopicus*	-	LC	II (subsp. aethiopicus)	-	Decreasing	X	D
“Waterbirds”	Greater Flamingo	*Phoenicopterus roseus*	NT	LC	II	-	Increasing	X	C; D
“Waterbirds”	Cape Shoveler	*Anas smithii*	-	LC	II	-	Increasing	-	D
“Waterbirds”	Maccoa Duck	*Oxyura maccoa*	NT	NT	II	-	Decreasing	-	D
“Nocturnal Raptors”	Spotted Eagle-Owl	*Bubo africanus*	-	LC	-	-	Stable	X	D, H
“Accipitrids”	Verreauxs' Eagle	*Aquila verreauxii*	VU	LC	II	-	Stable	X	C, D, H
“Accipitrids”	Booted Eagle	*Hieraaetus pennatus*	-	LC	II	-	Decreasing	X	C, D, H
“Accipitrids”	Martial Eagle	*Polemaetus bellicosus*	EN	VU	II	-	Decreasing	X	C; D; H
“Accipitrids”	Black-chested Snake Eagle	*Circaetus pectoralis*	-	LC	II	-	Unknown	X	C; D; H
“Accipitrids”	Jackal Buzzard	*Buteo rufofuscus*	-	LC	II	(*)	Stable	X	C, D, H
“Accipitrids”	Pale Chanting Goshawk	*Melierax canorus*	-	LC	II	-	Stable	X	C, D, H
“Accipitrids”	Black Harrier	*Circus maurus*	EN	VU	II	(*)	Stable	X	C, D, H
“Accipitrids”	African Harrier-Hawk	*Polyboroides typus*	-	LC	II	-	Stable	X	C, D, H
“Falcons”	Rock Kestrel	*Falco rupicolus*	-	NA	II	-	NA	-	C, D, H
“Falcons”	Greater Kestrel	*Falco rupicoloides*	-	LC	II	-	Stable	X	C, D, H
“Bustards”	Ludwig’s Bustard	*Neotis ludwigii*	EN	EN	-	-	Decreasing	X	D, H
“Bustards”	Karoo Korhaan	*Eupodotis vigorsii*	NT	LC	-	-	Increasing	X	D, H
“Phasianids”	Grey-winged Francolin	*Scleroptila africana*	-	LC	-	SLS	Stable	X	D, H
“Phasianids”	African Snipe	*Gallinago nigripennis*	-	LC	II	-	Unknown	-	D
“Passerines”	Common Swift	*Apus apus*	-	LC	-	-	Decreasing	-	C; H
“Passerines”	Cape Clapper Lark	*Mirafra apiata*	-	LC	-	(*)	Decreasing	-	C, D, H
“Passerines”	Karoo Lark	*Calendulauda albescens*	-	LC	-	(*)	Decreasing	-	C; D; H
“Passerines”	Large-billed Lark	*Galerida magnirostris*	-	LC	-	(*)	Increasing	-	C, D, H

1.1.2 Terms of Reference

The Bird Impact Assessment to inform this Impact Assessment was conducted according to the specialist Terms of Reference:

- Adherence to the content requirements for specialist reports in accordance with Appendix 6 of the EIA Regulations 2014, as amended;
- Adherence to all appropriate best practice guidelines, relevant legislation and authority requirements.
- Provide a thorough overview of all applicable legislation, guidelines.
- Cumulative impact identification and assessment as a result of other renewable energy (RE) developments in the area (including; a cumulative environmental impact table(s) and statement, review of the specialist reports undertaken for other Renewable Energy developments and an indication of how the recommendations, mitigation measures and conclusion of the studies have been considered). The EAP, in conjunction with the client will aim to provide additional reports should these be requested/required by any of the specialists.
- Identification of sensitive areas to be avoided (including providing shapefiles/kmls).
- Assessment of the significance of the proposed development during the Pre-construction, Construction, Operation, Decommissioning Phases and Cumulative impacts. Potential impacts should be rated in terms of the direct, indirect and cumulative.
  - Direct impacts are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.
  - Indirect impacts of an activity are indirect or induced changes that may occur as a result of 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 as a result of the activity.
  - Cumulative impacts are 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. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.
- Comparative assessment of alternatives (infrastructure alternatives have been provided).
- Specifically, state which alternative is preferred. If all are equally preferred, please state this.
- Recommend mitigation measures in order to minimise the impact of the proposed development.
- Implications of specialist findings for the proposed development (e.g. permits, licenses etc).
- Specify if any further assessment will be required. Include an Impact Statement, concluding whether project can be authorised or not
- A key task for the specialists is to review the existing sensitivity mapping from the SEA for the project area and provide an updated sensitivity map for the Rondekop WEF project site.
- Adhere to the requirements of specialist studies in terms of Appendix 6 of the NEMA EIA Regulations (2014), as amended.

Specific ToR:

- Describe the affected environment from an avifaunal perspective, including consideration of the surrounding habitats and avifaunal features (e.g. Ramsar sites, Critical Bird Areas, wetlands, migration routes, feeding, roosting & nesting areas, etc).
- Describe and map bird habitats on the site, based on on-site monitoring, desk-top review, collation of available information, studies in the local area, previous experience.
- Map the sensitivity of the site in terms of avifaunal features such as habitat use, roosting, feeding and nesting/breeding.

- Ensure that the Bird assessment is in line with the Birds and Wind-Energy Best Practice Guidelines, 2015.
- Identify and assess the potential impacts of the proposed project on avifauna, including impacts that may be seasonal or diurnal, or linked to specific species and their feeding, roosting or nesting habitats and habits. Provide sufficient mitigation measures to include in the environmental management plan.

1.1.3 Approach and Methodology

The proposed methodology assumes as a baseline the requirements outlined by the most recent version of the Best-Practice Guidelines for assessing and monitoring the impact of wind-energy facilities on birds in southern Africa (Jenkins *et al*., 2015). Complementarily, the methodology is also based on current international best practice (Table 2). In order to conduct the impact assessments for this project, a comprehensive methodology (constructed by SiVEST) was followed to determine the significance of impacts on various issues identified, with and without mitigation measures. The results of these methodologies can be seen further on in section 1.7 of this report.

Prior to the initiation of field surveys, a desktop survey was conducted to compile the best information possible, in order to provide a better evaluation of all conditions present within the study area. Therefore, data sources (as detailed in Table 2) were consulted in order to assess the species likely to occur within the study area. The following steps were taken:

- Based on a desktop study and considering all literature references available (Table 2), a list of all bird species considered to potentially occur within, or in close proximity to the site was compiled.
- Abundance of all species listed from the aforementioned process was assessed at a national level in terms of endemism, population trend, habitat preferences and conservation status.
- The sensitivity of these species towards the potential impacts from wind energy developments was evaluated using the Avian Wind Sensitivity Map (Retief *et al*., 2012). Other species not listed in the referred document were also considered sensitive because of their abundance, flight characteristics, ecological role, population trend and conservation status.
- A short list of sensitive species for this study species, to which the assessment and monitoring programme should pay special attention to, was compiled and supplemented with sensitive species identified in the previous steps.
- A desktop study, based on all the available information such as topographic South Africa maps, Google Earth imagery, and Geographical Information System (GIS) software was conducted for a preliminary evaluation of the area.
- Micro habitats and vegetation units were characterised using Google Earth imagery and refined during the field visits conducted to the site through the monitoring programme.

The pre-construction bird monitoring programme included the following components:

- Vantage points – to allow for the detection of large bird species present in the study area, the estimation of their abundance, seasonality and the characterisation of their flights, and to gain a general idea of their use of the habitats. This data is important in achieving Objectives a) to e) in Section 1.1.1).
- Walked linear transects – designed to survey passerines and other small to medium sized birds. Using this technique, densities and composition of these groups of birds are estimated for the different habitats, seasons and sampling sites. This data is important in achieving Objectives a) to e).

- Vehicle based transects – implemented to detect other large bird species less prone to flight (such as Bustards) and allows covering greater areas in the WEF surroundings. This technique was used to complement nest and roost surveys and for defining the distribution of sensitive species. This data is important in achieving Objectives a) to e).
- Waterbodies monitoring – used for characterising the use of these features by Waterbirds and contribute to Objectives a) to e).
- Inventory, search, inspection and monitoring of breeding evidences. This data is important in achieving Objectives a) to e).

The implementation of the continuation of a similar monitoring programme during the construction and operational phases of the development is necessary, while the operational phase should also include the implementation of bird carcass searches around the turbines and determination of the searcher efficiency and carcass persistency (by scavengers or decomposition) which will provide data to quantify bird fatalities associated with the WEF and determine the species affected as per the recommendations of the best practice guidelines.

By referring to the baseline scenario established (regarding the scope of the present report) and implementing a BACI analysis, it will be possible to validate the potential impacts identified and to determine if other impacts are occurring, and adequately adjust any mitigation measures proposed at this stage (or propose new and more appropriate ones if necessary).

The monitoring effort and methodological approach was defined and implemented.

While the main emphasis of the pre-construction monitoring programme was focussed on the sensitive species identified (

Table 1), a systematic approach was implemented in order to determine the general composition of the bird community within the study area, as well as to evaluate the potential negative effects that the operational phase of the Rondekop WEF has on this group. The surveys conducted involved several methodologies and procedures.

Vantage points monitoring

Vantage point surveys were conducted by two technicians accordingly to the most recent recommendation from the best practice guidelines at the time (Jenkins *et al*. 2015). In some cases, observers would split vantage points due to time or logistical reasons, but only if conditions were deemed suitable for it. Each location was surveyed for a minimum of 12 hours of observation per season (winter, spring, summer and autumn) divided through the early morning, midday and late afternoon times of day.

As mentioned, in terms of Vantage Points, the protocols established by Jenkins *et al.* (2015) were used. Vantage Points were not conducted according to the new Verreaux's Eagle Guidelines (Birdlife South Africa, 2017), as these only came into effect after the pre-construction monitoring campaign had already concluded (conclusion in September 2016). However, the recommendations for mitigation strategies have been considered for this report, wherever pertinent.

Vantage points were used to detect sensitive species, focused on Raptors and other large birds. Therefore, a systematic approach to detect and characterise the species of this group, many of them endangered or sensitive species, was implemented. This methodology included a standard way of collecting data (e.g. flying patterns and characteristics), which allows for the comparison between different areas and sampling periods (SNH 2009; Atienza *et al*. 2011; Strickland *et al*. 2011; Jenkins *et al*. 2012). Each Vantage Point was monitored by two expert bird observers, for 12 hours (distributed evenly among the (early) morning, midday and (late) afternoon periods) per season (over all four seasons). Twelve vantage points were monitored throughout the monitoring programme, including six located within the Wind Energy Facility and six at the Control site.

This methodology allows the collection of accurate records based on the movements of Raptors and large birds through the study area. The main objectives for this methodology was to record the behaviour, estimate activity indexes and, if possible, determine the number of breeding pairs (if any) that frequently utilise the study area.

The following parameters were evaluated:

- Activity Index – determined by considering the number of contacts per observation hour. In this case every bird is considered a contact, thus a flock of five birds would be considered five contacts.
- Activity at Rotor Swept Area – determined by considering the number of contacts per observation hour spent in the space considered between the lower turbine blade tip and the upper blade tip.
- Time use at Rotor Swept Area – this parameter was determined by considering the amount of time spent at rotor height in relation to the total time spent flying through the area.
- Risk Analysis – The probability of collision of any bird species in the study area was determined by analysing the collision prone behaviours at a wide range of Rotor swept area ranging between 40 and 230 m.

All the data collected during the fieldwork (vantage points and complementary records recorded during observer's movements throughout the study area) were inserted into a geographical information system in order to map the areas used by sensitive species and to perform a spatial analysis of the results. This allowed the estimation of several indexes and parameters, calculated by analysing the distribution of the flight records throughout the area.

In order to assess variations in the spatial utilisation of the different bird species, the analysis was conducted for different groups based on particular characteristics relevant to their biology, ecology and behaviour. This classification is not just ecological, but rather practical and aiming to focus on the specific impacts likely to occur as a result of the installation of the WEF, depending on the characteristics of the birds affected. Thus, the species were divided into groups (
Table 1):

- *Accipitrids* - fairly large raptors, usually presenting a large wingspan and making use of thermal uplifts or hillside currents when soaring or gliding;
- *Falcons* - usually smaller raptors that make use of fast flight. Many of them display specific hunting behaviours such as hovering while looking for small prey. Some species tend to roost and hunt in large numbers,
- *Crows* - corvid species are classified within this group. They are usually common, widespread, opportunistic species. Although they often tend to fly at rotor height, they have not been found to be particularly affected by wind energy facilities. Sometimes they appear in large numbers and their populations are often unbalanced by the extra available resources found in human-influenced habitats.
- *Waterbirds* - mainly ducks, cormorants, geese and other waterbody-associated species (usually swimmers or divers) appear in this group.
- *Ciconids* - Ibis, Egrets and Herons mainly. While also being closely associated to water, these species are not swimmers or divers and are, in fact, often found away from actual waterbodies but in relatively muddy areas.
- *Bustards* – large to medium sized terrestrial birds, usually associated with agriculture areas where they tend to gather and forage. Includes bustards and korhaans, several of these species being endemic or near endemic to southern Africa. Most have the ability to make short commuting flights, while other species, can even migrate.
- *Phasianids* – mainly spurfowl, snipe, francolin etc. These birds are heavy, ground-dwelling birds with not much potential to at rotor heights.

Linear walking transects

To characterise the passerine and small bird communities occurring in the study area, walked transects were used – as recommended by the best practice guidelines at the time (Jenkins *et al.*, 2015). This is a technique used to produce estimates of densities/actual numbers of bird species - making it a very thorough and sufficient means of measurement for the application.

The following parameters were estimated for each species and transect, both in the wind energy facility as well as in the control area:

- Relative density, expressed as the number of birds per hectare, per study area (WEF and Control). This variable takes into account the probability of detection of the different groups of species into consideration.
- Occurrence of sensitive species in the vicinity of the proposed facility and its immediate surroundings.

The analysis of all collected data parameters allows for the detection of spatial and temporal variations being placed on the bird community occurring at the study area, as well as for important and/or special areas for sensitive species. Density estimation was conducted using Distance© 6.2 Release 1 (Thomas *et al.*, 2010). Density estimation was applied to the general community using Conventional Distance Sampling analysis (Buckland *et al*. 1993, 2001) per season and per major biotope. A second analysis was conducted focusing on the groups of species with a higher frequency of detection (n ≥ 40).

Vehicle based transects

As a complementary method, seven vehicle-based transects were conducted – four in the WEF- and three in its immediate surroundings – measuring approximately between 5 and 9 km each (Appendix I - Figure 11).

The purpose of the survey was to provide a measure of abundance and richness for those species observed (large terrestrial birds and raptors). At the same time, this information complements that obtained from the vantage point surveys and aids in the detection of species less prone to flying, such as bustards. It also helps in detecting roosting and nesting sites as it covers extensive areas in a short period of time.

Each transect was conducted by two expert observers; one driving slowly and the other recording all of the contacts being seen or heard. During each linear transect, the total number of birds observed was counted and recorded. The following parameters were recorded: species and number of individual's present, perpendicular distance from the road, bird activity at the moment of observation and any additional notes that were considered relevant. If the contacts were seen flying, it was noted. The distance from the observer to the point where the bird was first detected was then recorded.

The following parameters were recorded, and all records were taken note of on a standard field sheet specifically designed for this methodological approach:

- bird species, gender and age (whenever possible);
- number of individuals;
- perpendicular distance from the road;
- bird activity observed and type of observation (acoustic/visual).

Whenever relevant, additional information was collected in order to contribute to the detailed characterisation of areas usage by the species.

Breeding Evidences

Surveys were conducted in and around the area in order to detect breeding evidences and/or roosting locations of sensitive species. These surveys took place in every season. The habitats located within the impact zone are likely to support key species, such as cliffs, power lines, stands of large trees, marshes and drainage lines (Malan, 2009) which were surveyed by the combination of different inspection techniques according to the specifics of each site.

The location and status of the nests were determined by active searches and direct observations, by making use of a handheld GPS (Garmin® ETREX 10 and ETREX 20), a pair of binoculars and a spotting scope. After a nest was located, the observer spent time observing it. The following parameters were registered: type of nest (e.g. cliff, tree, pylon, building, rock cavity), vertical position at the supporting structure of the nest, orientation (north, south, etc.), status (e.g. good condition, bad condition, collapsed) and, whenever possible, construction phase (e.g. inactive, building, fixing, green branches). When an active nest was found, the following parameters were registered: reproduction phase (e.g. construction, incubation and chicks), presence of parents in the nest, number of eggs, number of descendants/flying offspring. Whenever relevant, additional information was registered according to observations found in the field.

Waterbody monitoring

Waterbodies were searched for within the proposed wind energy facility and surroundings. When relevant features were found, they were mapped on GIS by using 1:50 000 topographic maps and aerial photography, and later surveyed in order to determine their level of utilisation/importance by Waterbirds.

Any water bodies that were found to be most relevant (due to their size and ability to hold water in the rainy season) were visited by two expert observers at least twice during the pre-construction monitoring campaign (at least once in winter and once in summer), in accordance with (Taylor *et al*. 1999). The observers were aided by a pair of binoculars and a spotting scope. The monitoring approach always followed the established methodology for the Coordinated Waterbird Counts (Taylor *et al*., 1999). The observations were made simultaneously by two observers, from a fixed point, for a minimum of 30 min and was generally conducted during the same hours (mostly in the midday) across the entire monitoring campaign, as far as possible. The species present were then recorded at the beginning of the observation. For the remaining period, the observer recorded the main movements around the water body. The following parameters were registered: species and number of birds present, gender and age (adult, juvenile/chicks) (whenever possible), direction of arrival/departure from the water body and any additional notes that may have been important.

Incidental Observations

All contacts of sensitive species during the driving and/or walking transects of the observers in the study area were recorded as incidental observations and were used as complementary data to characterise the bird community and its utilisation of the site, as recommended by the Best Practice Guidelines (Jenkins *et al*., 2015) and the previous stages of the monitoring programme.

Control Area

A Control area was considered for this project, located approximately 2 km south of the proposed WEF site (Figure 11). This area was selected due to its extreme similarities to the study site, in terms of vegetation and topography. Both sites are equally comprised of Central Mountain Shale Renosterveld and Koedoesberge-Moordenaars Karoo vegetation (Mucina & Rutherford, 2006). Additionally, both sites also exhibit mountainous regions with shallow valleys. As such, very similar bird micro-habitats are expected to occur in both areas. Data gathered at this similar area will allow a comparison of the results obtained with a reference, non-affected area, in order to distinguish between impacts produced by the project and background effects produced by natural processes (SNH 2009; Atienza *et al*. 2011; Strickland *et al*. 2011; USFWS 2012; Jenkins *et al*. 2015).

Sampling Period

The surveys of the bird community monitoring programme were conducted between January and October 2016. The field surveys were conducted so that the area was surveyed throughout all seasons of the year, in compliance with the requirements of the Best Practice Guidelines (Jenkins *et al*., 2015). Therefore, the monitoring programme included a total of 8 visits to the site where all methodologies were implemented in each season: walked transects and vantage points, as well as other methodologies, spread over the pre-construction monitoring year.

The timing of site visits was conducted as follows:

- Summer
    - 12th to 22nd January 2016
    - 3rd to 13th February 2016
- Autumn
    - 1st to 11th April 2016
    - 17th to 27th May 2016
- Winter
    - 21st to 28th June 2016
    - 15th to 26th August 2016
- Spring
    - 6th to 15th September 2016
    - 26th September to 5th October 2016

1.1.4 Assumptions and Limitations

The following assumptions and limitations apply:

- The pre-construction bird monitoring is based on both primary (data collection) and secondary data sources, such as those indicated in section 1.1.5.
- Any inaccuracies or lack of information in the bibliographic sources consulted could limit this study. In particular, the SABAP1 data is now fairly old (Harrison *et al*., 1997). To surpass this possible problem in the data used, the more recent and updated SABAP2 was consulted. However, the number of lists submitted for this area in the SABAP 2 is not yet adequate for the single use of this more recent data source. Therefore, both South African Bird Atlases (Project 1 and 2) were consulted in a complementary way. Species were considered as being possibly present within the study area if they occurred in any of the pentads, QDGS or wetland sites considered for analysis. Coordinate Avifauna Roadcounts data and Coordinated Waterbird Counts data was also requested for consideration in this study. A final bird list to inform sensitivity has subsequently been produced and tabulated in the final monitoring report (Bioinsight, 2018). Similarly, data from all nearby projects was difficult to attain for the purposes of this report. However, reports from 11 of these surrounding projects were obtained and considered where considered relevant (such as priority species nesting sites and cumulative impacts etc.).

- As vantage points had good visibility conditions, it was assumed that not only flying birds but also individuals on the ground should be detected. However, large terrestrial birds which do not fly often or spend long periods on the ground, would be more difficult to detect on hilly or wooded areas. This fact directly implies that activity indexes for these species can be underestimated. To deal with this issue a vehicle based transect was set up in the development area. This allowed moving through the area and having different perspectives over topographic features - therefore increasing the chance of detecting these types of birds, though activity indexes obtained through these two different methods cannot be directly compared.
- Vantage point surveys are only conducted during daylight. Therefore, any bird movement occurring at night is not recorded.
- At this stage, no inter-annual variations are taken into consideration as only one year of data has been collected. Nevertheless, the basis for comparisons with subsequent years has been established.
- The recommendations on the current version of the applied guidelines were followed to the maximum extent possible and exceeded whenever feasible. The methodologies implemented were adjusted to the specificities of the area. Compliance and any deviations from the guidelines are presented in this report.
- Mitigation measures pertaining to any avifaunal component that are inherent to the project design, include the complete avoidance of any areas that are considered to have a very high sensitivity (i.e. no-go areas).
- Cumulative impacts are assessed by adding expected impacts from this proposed development to existing and proposed developments with similar impacts, within a 50km radius. The existing and proposed developments that were taken into consideration for cumulative impacts are listed in Appendix 2.

1.1.5 Source of Information

A desktop survey was conducted to compile the best information possible, in order to provide a better evaluation of all conditions present within the study area. Therefore, the available data sources (Table 2) were consulted to assess which species could occur in the different habitat occurring at the Rondekop WEF study area. The following steps were taken:

- Based on a desktop review and considering all literature references available, a list of all bird species with potential to occur within or in close proximity to the site was compiled.
- Literature references and local farmers were consulted concerning any available information regarding presence of known nests/roosts in the vicinity of the proposed site. Literature review was conducted regarding wind developments in South Africa or similar environments.
- All listed species were assessed at a national level in terms of endemism, population trend, habitat preferences and conservation status.
- All listed species were classified in terms of probability of occurrence within the site, considering several criteria evaluated in conjunction with one another, such as historical confirmation of species in the area, presence of known nests/roosts and presence of suitable habitats, etc.
- The vulnerability of these species to potential impacts caused by wind energy developments (in terms of potential collision risks with wind turbines) was evaluated according to the most recent "South African Good Practice Guidelines for Surveying Birds on Wind Farms" (Jenkins *et al*., 2015).

- A short list of sensitive species was identified to which the assessment and monitoring programme paid special attention to. Sensitive species were identified by means of a specific structured decision process based each species' conservation status, vulnerability to collision and ecological characteristics such as migratory behaviour.
- A desktop study, based on all the available information such as topographical maps of South Africa, Google™ Earth imagery, and Geographical Information System software was conducted for a preliminary evaluation of the area. A reconnaissance field visit was conducted in February 2016 to achieve an initial understanding of characteristics of the site.
- It was important to characterise the study area in terms of the vegetation and habitat present on site. The method used for vegetation classification is that developed by Mucina & Rutherford (2006 – recently updated to version 2018). At a micro level, it was also important to define presence of specific features that could shape the local occurrence and bird distribution within the site. Bird abundance and movements are largely related to certain vegetation features such as tree-lined avenues, hedges and other relevant features which could potentially be used as corridors or feeding/roosting grounds. It was therefore essential to also characterise the study area in these terms. Google™ Earth imagery and most importantly, the field work, which was used to identify the available micro-habitats on site.

Table 2 includes (although not limited to) the list of data sources and reports consulted and taken into consideration, for the compilation of this report, in varying levels of detail. Other references were consulted for particular issues (these are detailed in section 1.10).

Table 2 - Data sources consulted for the evaluation of the bird community present in the study area. The international references and guidelines used to support the methodological approach and result analysis are presented.

Type	Title	Bibliographic Reference	Detail of information
Data sources	South African Bird Atlas Project 2 (SABAP2)	http://sabap2.adu.org.za/	Local
	South African Bird Atlas Project 1 (SABAP1)	(Harrison, *et al*., 1997)	Local
	Avian Wind Farm Sensitivity Map for South Africa	(Retief, *et al*., 2012)	Pentad (5 x 5 minutes)
	Coordinated Avifauna Roadcounts (CAR)	http://car.adu.org.za/	Local level
	Coordinated Waterbird Counts	http://cwac.adu.org.za/	Local level
	Birds of Southern Africa	(Hockey, Dean, & Ryan, 2005)	National level
	BirdLife South Africa Checklist of Birds in South Africa 2016	(BLSA, 2016)	National level
	The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland	(Taylor, Peacock, & Wanless, 2015)	National level
	Renewable Energy Application Mapping. Fourth Quarter 2018	(DEA, 2018)	National level
	Global List of Threatened Species	(IUCN, 2016)	Global level
Guidelines and other international references	BirdLife South Africa/Endangered Wildlife Trust best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa	(Jenkins *et al*., 2015)	National level Methodological approach
	Vearreaux's Eagle and Wind Farms Guidelines for impact assessment, monitoring and mitigation	(Birdlife South Africa, 2017)	National level Methodological approach
	Wind energy development and Natura 2000	(European Commision, 2010)	International level Methodological approach and analysis
	Good Practice Wind Project	www.project-gpwind.eu/	International level Methodological approach and analysis
	Comprehensive Guide to Studying Wind Energy/Wildlife Interaction	(Strickland *et al*., 2011)	International level Methodological approach and analysis
	U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines	(USFWS, 2012)	International level Methodological approach and analysis
	Guidelines for impact assessment of wind farms on birds and bats	(Atienza, Martin Fierro, Infante, Valls, & Dominguez, 2011)	International level Methodological approach and analysis
	Windfarm impacts on birds guidance	www.snh.gov.uk/	International level Methodological approach and analysis

The key source of data is that collected onsite during the 12-month pre-construction monitoring programme.

1.2 DESCRIPTION OF PROJECT ASPECTS RELEVANT TO AVIFAUNAL IMPACTS

Rondekop WEF is a renewable energy (wind) development that has a generating capacity of up to 325 MW, and plans to include up to 48 wind turbines (each having a generating capacity of up to 8MW). It is located 45 km south-west of Sutherland, in the Northern Cape province of South Africa. This project is located partially inside the Komsberg Renewable Energy Development Zone (REDZ 2), and as such – has to undergo a full EIA. The project aspects relevant to avifauna include:

Presence of Wind Turbines

The presence of wind turbines, in general, can result in certain avifaunal impacts such as fatalities due to collision, as well as disturbance / displacement effects. It is very important that turbines are sited correctly, to avoid and/or minimise these potential impacts. Careful planning and avoidance measures is therefore crucial to achieve this.

Turbine machine specifications

In terms of turbine specifications, the most relevant aspect to consider is the machine size, in terms of rotor diameter and lower tip height. The turbines proposed for the Rondekop project have a hub height of up to 140 m (lowest 90 m), with a rotor diameter of up to 180 m (shortest 10 0m), making it a relatively large machine. Larger machines with bigger rotor diameters are generally considered better for avifauna, as they would restrict the project to have fewer wind turbines – due to their increased generating capacity. As a result of a larger machine, the lower tip height is also higher than that of smaller machines. This is considered relatively safer for smaller passerine species, as well as some medium-large terrestrial birds that are not known to frequently use the higher air spaces – subsequently reducing the risk of collision with turbine blades. It is important to note that the minimum lowest tip (of the blade) should not encroach an area that is lower than 40 m above ground, which is noted as the worst case of the proposed turbine dimensions.

Wind measurement masts

The presence of four wind measurement masts may pose a risk to several avifauna species, due to the presence of guyed wires that are used to anchor the masts in place. These guyed wires are known to cause bird fatalities due to the collision of birds with these wires. Several measures can, however, be used to minimise the risk of collision. These mitigation measures have been included in the recommendations to be included in the EMPr.

Underground 33kV cabling and Overhead 33kV Power Lines

The use of underground cabling is preferred to overhead power lines. However, it is important to note that underground cabling may also result in habitat destruction. This impact is considered to have long-term effects. More relevant to the Rondekop Project is the proposed use of a 33kV overhead power line that will be used to group turbines to crossing valleys and ridges outside of the road footprints, in order to reach the 33/132kV onsite substation. This overhead line may potentially serve as a source for bird collision fatalities, if not managed correctly. Regardless, even though underground cabling is preferred (and preferably along roads where groundworks already exist), overhead lines are still allowed – provided they are carefully managed according to the mitigation measures listed in this report.

Other associated Infrastructure

Other sources of disturbance and habitat destruction can be the presence of other associated infrastructures, such as electrical transformers, access roads, a substation, temporary construction camp, fencing around the batching plant and construction camp, and temporary infrastructure to obtain water from available sources. These infrastructures are however not expected to have a significant impact on the avifaunal community due to some of the structures only being temporary, and also due to the fact that the area required for construction only represents a small percentage of the total area available with the same habitat characteristics.

Alternative/Updated Layouts

Regarding the available layout options that were provided for consideration in this Impact Assessment Report, it can be confirmed that all updated layouts, as well as the preferred options and all of their alternatives were thoroughly analysed to further inform the broader environmental authorisation process. The alternatives considered included:

- Access Roads: Various access road alternatives are currently proposed to connect the R356 to the three ridges. The proposed access to the site is from the tarred R354 connecting Matjiesfontein and Sutherland, turning north-west onto R356 provincial gravel road and heading west from where the access roads branch off. Three access road alternatives would connect the public R356 road to the new wind farm road network between the turbines on the ridges namely:
    - North Ridge:
        - Access road alternative North 1, route is approximately 11.8 km in length, almost all of which comprises an existing farm road that will need to be upgraded.
        - Access road alternative North 2 is approximately 12.8 km in length and branches off the R356 and follows an existing farm road that will need to be upgraded.
    - Centre Ridge:
        - Access road alternative Centre 1 is approximately 2.6 km in length and branches off the R356 to the north and connects between turbine 31 and 32.
        - Access road alternative Centre 2 is approximately 3.1 km in length and branches off the R356 and connects to the site near turbine 28.
    - Southern Ridge:
        - Access road alternative South 1 is approximately 1.9 km in length and branches off the R356 to the south and connects near turbine 45.
        - Access road alternative South 2 is approximately 4.2 km in length and branches off the R356 to the south and connects near turbine 42.

- Construction Camps: Six alternative construction camp layouts, including the area required for a batching plant, will be assessed, namely:
    - Construction Camp Alternative 1 is located adjacent to Access Road Alternative North 1 on the Farm 224 Ashoek at the end of an existing farm road.
    - Construction camp Alternative 2 is also located adjacent to Access Road Alternative North 1 on the Farm 224 Ashoek at the end of an existing farm road.
    - Construction Camp Alternative 3 is located adjacent to and east of the R356 public road on the Remainder of farm 190 Wind Heuvel.

  - Construction Camp Alternative 4 is located at the intersection of an existing 4x4 track and the R356 on portion 1 of farm 190 Wind Heuvel.
  - Construction Camp Alternative 5 located at the intersection of the R356, access road alternative centre 2 and access road alternative south 1 extending to the north on the remainder of farm 192 Bloem Fontein.
  - Construction Camp Alternative 6 is located to the west of access road alternative centre 2 north of the R356 on the remainder of farm 192 Bloem Fontein.

- Substations: Six onsite 33/132kV substation location alternatives were identified based on technical studies which considered aspects such as topography, earth works and levelling, environmentally sensitive features, electrical losses, turbine locations and existing agricultural use:
  - Substation alternative 1 is located south of turbine 22 on the remainder of farm 191 Hout Hoek.
  - Substation alternative 2 is located south of substation alternative 1 on the remainder of farm 191 Hout Hoek.
  - Substation alternative 3 is located south east of substation alternative 2 on the remainder of farm 190 Wind Heuvel.
  - Substation alternative 4 is located north east of substation alternative 3 on the remainder of farm 190 Wind Heuvel.
  - Substation alternative 5 is located west of construction camp alternative 4 along an existing 4x4 jeep track.
  - Substation alternative 6 is located adjacent to access road alternative centre 1 to the east on portion 1 of farm 190 Wind Heuvel.

1.3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

At a macro level, there are no nature conservancy areas, to our present knowledge, within a 30 km radius of the proposed development area. The proposed Rondekop WEF site is located approximately 40 km south-east of the Tankwa Karoo National Park, 90 km north-east from Swartberg Mountains Important Bird Area (IBA) (SA106), 50 km east of the Cedarberg – Koue Bokkeveld Complex IBA (SA101) and 61 km north from Anysberg Nature Reserve Important Bird Area (SA108) (Figure 1). Considering that these areas are located at a considerable distance from the proposed WEF area it is not expected that the species using them are affected in any way by the implementation of this project. Nonetheless the analysis of the bird species that are present in these areas, which are of similar nature to the Rondekop WEF proposed area, may provide an indication on the suite of species likely to be present in the study area.

It must be noted that the proposed development area shown in this report (Figure 1, onwards) is that representative of the approximate area for turbine placement, and subsequently also represents the core area that has the most relevance/importance in terms of the impacts on the bird community on site. As such, this area will be assessed throughout this specialist impact assessment report. Regardless, it must be noted that associated infrastructures can be inside/outside of this area but is not a limitation to this study – as most of the impacts are likely to occur within the boundaries illustrated from a avifaunal perspective.

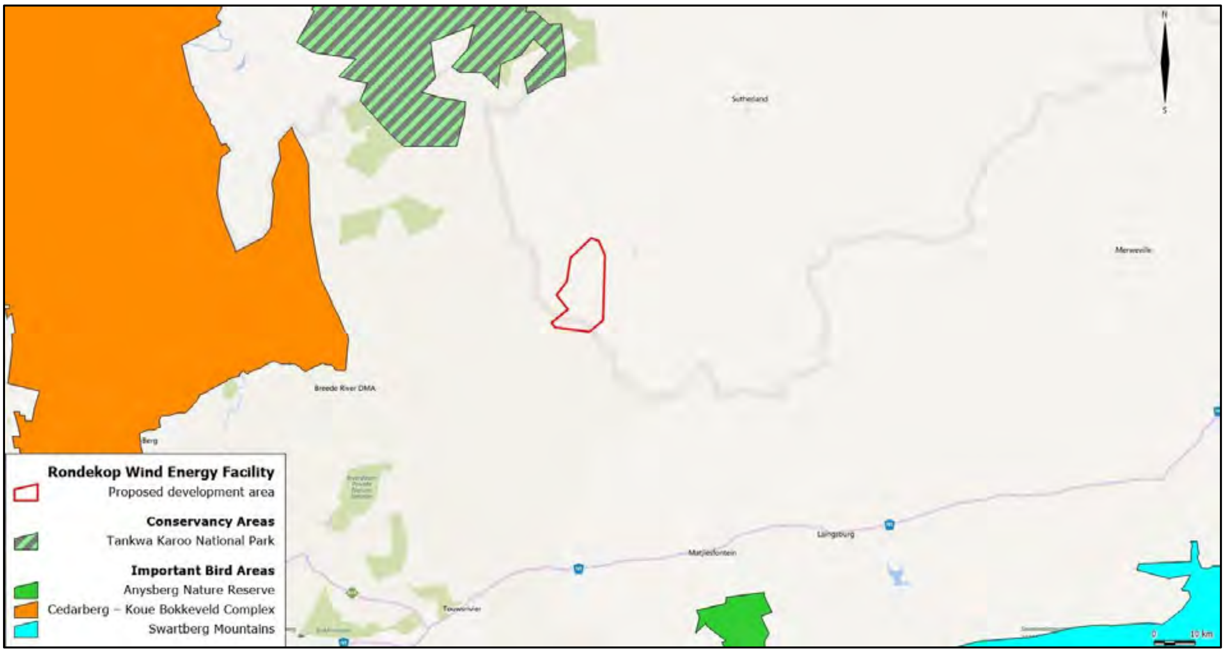

Figure 1 - Location of the Rondekop WEF in relation to the surrounding conservancy areas (background image source: Google Earth Street Maps)

At the WEF site level, the site falls within the Succulent Karoo and the Fynbos biome, with the occurrence of two main vegetation types (Mucina & Rutherford, 2006 – updated to 2018) (Figure 2):

- Central Mountain Shale Renosterveld (Fynbos biome): associated with areas of slopes and broad ridges where the vegetation is predominantly tall shrubland and renosterveld composed by non-succulent karoo shrubs and a rich flora in rockier areas.
- Koedoesberge-Moordenaars Karoo (Succulent Karoo biome): this type of vegetation is found in slightly undulating to hilly landscape and is characterised by low succulent scrub with interspersed taller shrubs. Rain may occur through the year though it is more likely during winter season – two rainfall peaks during the year: one in March and the other in May – August.

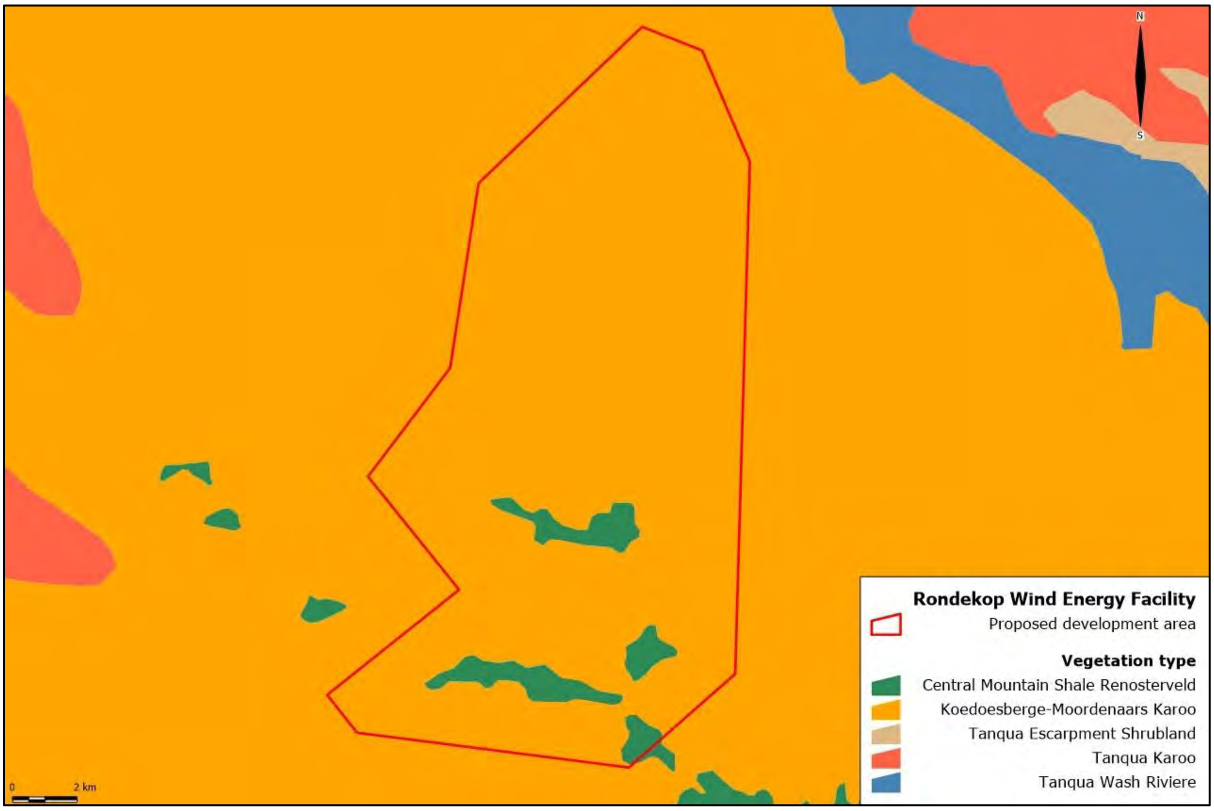

Figure 2 - Vegetation units present within the Rondekop WEF and surrounding area according to Mucina & Rutherford (2006) updated to version 2018.

The site is characterised by accentuated mountainous areas with very difficult human access and therefore it is in almost pristine natural conditions. Vegetation is adapted to the semi-arid conditions and harsh rocky conditions. Currently the area where Rondekop WEF is proposed shows no signs of intense disturbance other than that caused by natural impacts on the veld due to a three-year period of drought and grazing. Signs of human disturbance are characterised by the presence of a few farm houses.

Both the Fynbos biome and the Succulent Karoo biome are characteristic of higher altitudes and are present both in the bottom and top of the mountains. There are several species which are dependent on this type of habitat such as: Verreauxs' Eagle *Aquila verreauxii*, Grey-backed Cisticola *Cisticola subruficapilla*, Karoo Prinia *Prinia maculosa* and Grey-winged Francolin *Scleroptila africana*. Apart from the bird species that are naturally associated with the Fynbos and the Succulent Karoo biome, other species with more widespread distributions and less specific habitat requirements may also occur. These species are likely to be attracted by factors such as land-use, topography and the presence of drainage lines and water features in the surroundings of the site. Within the proposed Rondekop WEF site, however, the habitat is mostly reserved as low natural vegetation within a mountainous area, with some mostly dry water features. Regardless, species would still likely make use of these habitats occurring on site (Figure 3). For the potential/temporary Vearreaux's Eagle feeding site (Figure 3), it was initially determined that this site could be a nesting area for the species (due to white wash on the rocks, and due to the observation of an individual sitting nearby the edge of the ridge – next to the leg of a small mammal). However, upon further monitoring throughout the year, it was determined that this location was far too exposed for a Verreaux's Eagle to nest in, and that due to a lack of actual nesting substrate, the site would not be relevant for the breeding of the species. Additionally, a lack of evidence to suggest significant use of the area by this species would also be an indication that the site does not hold significant importance. As such, this area is not being considered as a sensitive location.

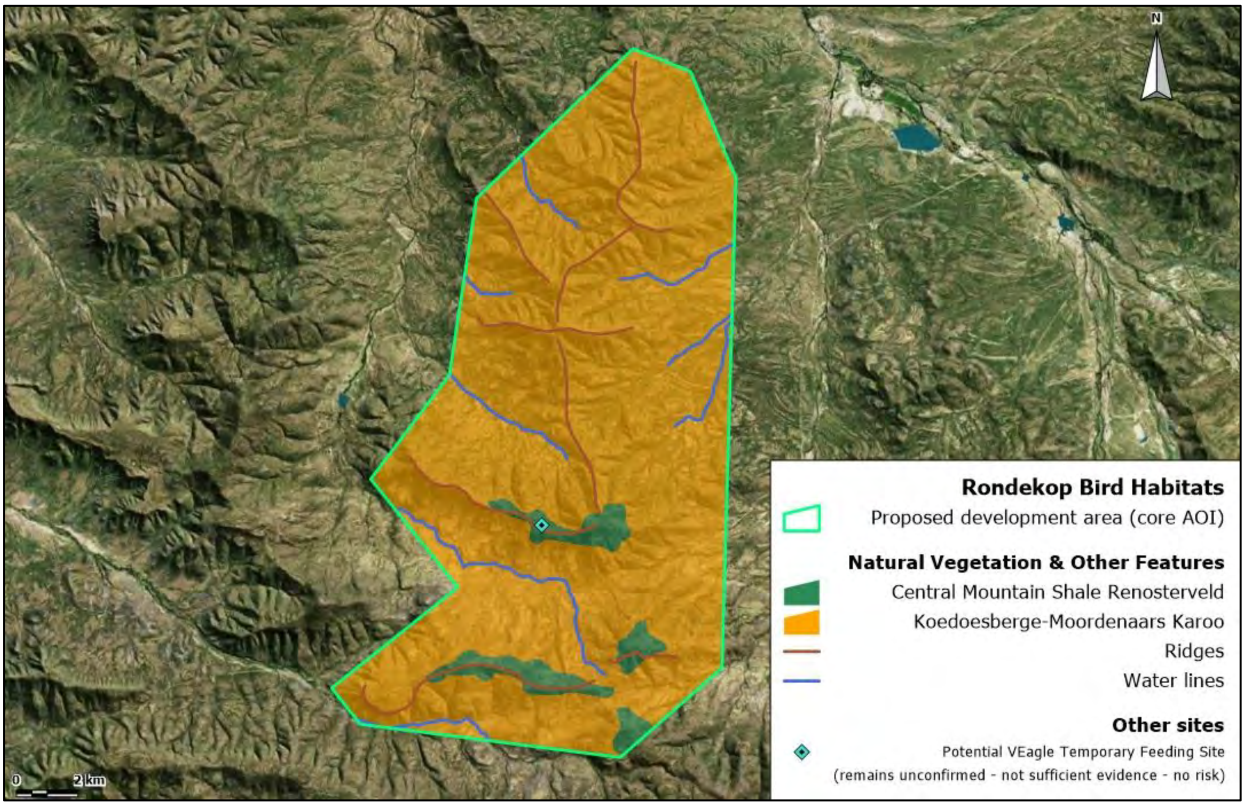

Figure 3 - Bird habitats occurring within the proposed Rondekop WEF

Rocky hillsides characterise a large portion of the site due to the site being relatively mountainous. These areas may also be important for certain species that use these areas for nesting or thermalling, such as: Rock Martin *Hirundo fuligula*, Rock Kestrel and Verreauxs' Eagle, among others. For this reason, the site has been generally classified as one with <u>medium</u> sensitivity, with some areas considered to be <u>very highly sensitive</u> (i.e. no-go areas that should be avoided from wind turbine and substation installation) (Figure 4).

- Medium sensitivity (Acceptable for turbine placement and associated infrastructure, but with mitigation measures)
    - *Hillside and Ridges*: This type of biotope is frequently used by Accipitrids and Falcons, for soaring and hunting flights, in which a lot of potential collision risk movements (flight at rotor height) are observed.
    - *Natural vegetation*: Within the proposed Rondekop WEF site the area is mostly comprised of natural vegetation. Avifaunal community, especially raptors usually will forage in natural veld, as well as the passerine community use this biotope for nesting and foraging.
- Very High Sensitivity (No-Go areas for turbine and substation)

    Riverine thickets: This type of biotope showed a high importance for passerine species as well as for Raptors and soaring birds. Considering the scarceness and sensitivity of this vegetation type to land modifications, a 200 m protection buffer is considered around the margins of the waterlines with this type of vegetation. No turbine placement or substation placement is allowed to occur within these buffered zones. Although it is advised for Overhead Powerlines to avoid these buffered areas as much as possible, they are allowed to be built within these buffered regions, as long as they run parallel with any bird flightpaths, as opposed to a more perpendicular orientation that could increase the risk of collision. This should be further assessed by the specialist for approval once the powerline layout becomes available. Existing roads should be used/upgraded as far as possible, within these areas. Any new roads should cross perpendicular, if new roads cannot be avoided.

- *Water bodies*: As these supply important sources of water, nesting and resting locations for many bird species (not only waterbirds), a 200m protection buffer is considered around any potential margins of water present within the study area.
- *Sensitive Flight Paths*: as activity index thresholds are not fully understood and enforced in South Africa, nor presented in the most recent version of the bird monitoring guidelines (Jenkins *et al*., 2015), it was determined that the best approach would be to follow the activity trends of familiar projects (from sites exhibiting similar characteristics). It was observed from a relatively nearby operational wind farm that high risk flights of priority species (where important fatalities were also noted) were generally orientated in areas where >1 contacts/hour were observed. As such, a grid analysis was conducted to determine the use of geographical space by certain bird species. It was subsequently decided that only sensitive species with >0.25 contacts per hour (precautionary approach) were to be considered in each 500x500m no-go square. A 200m buffer was then applied around each square to account for potential sensitive flight paths occurring on the inner border of each square.

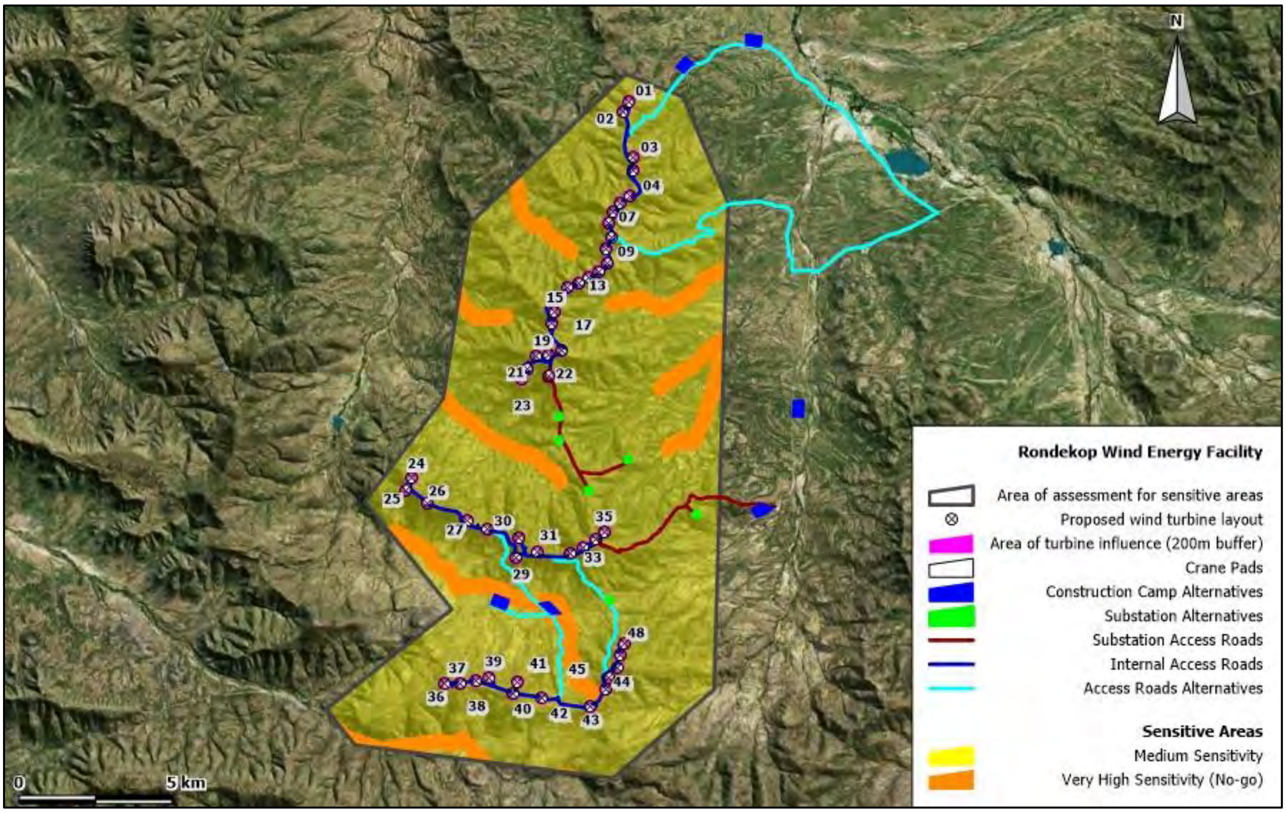

Figure 4 - Sensitive areas identified for birds during the pre-construction monitoring campaign at Rondekop WEF, overlaid with the proposed development features.

The aforementioned sensitivity classification has also been noted as being relatively representative of the broader region due to the information obtained from nearby proposed renewable energy developments. Williams (2014) explains that the proposed Karreebosch WEF is comprised of vegetation (particularly on ridges, where turbines are to be sited) that lacks resources to attract birds. Williams (2016) also specifies that the Brandvalley WEF has hilltops that are depauperate (in terms of bird numbers and diversity), and that only two areas showed a potential for collision risks. For the Rietkloof WEF, Williams (2016) states that the hilltops are depauperate for bird numbers and diversity, and that it is the general consensus that the available habitats cannot support more than a low number of species that have been identified to be at collision risk. Jenkins (2011) describes the Sutherland Renewable Energy Facility as one to have minimal negative impacts on key rare, red-listed and/or endemic species. However, species such as Verreaux's Eagle and Martial Eagle would likely experience important negative impacts. Regardless, it is also noted that these effects may be reduced to an acceptable and sustainable level if proposed mitigation measures are adhered to. Bioinsight (2016) mentions that the Gunsfontein Wind Energy Facility is a site that generally has a medium sensitivity, with some areas of high sensitivity. The Endangered Wildlife Trust (2012) identified that the Hidden Valley WEF is a site that is generally considered to be moderately sensitive in terms of avifauna, based on the occurrence of a number of listed species in the study area, as well as for the availability of various micro-habitats. The Roggeveld Wind Farm is also described as one to have bird-depauperate habitats and low numbers of birds with minimal probably impact on the local avifauna. Williams (2013) describes it as a project that is unlikely to have critical cumulative impacts due to the similarity of the regional ecology and terrain, as well as the lack of regular migratory movements across the region. For the Maralla East & West, and Esizayo WEF projects, van Rooyen (2016; 2016; 2016) mentions that the greatest cause for concern is a 70 km radius around the Komsberg substation for large raptor species – particularly in terms of cumulative impacts. However, with mitigation measures, the impact should be less severe at a national level, due to the large distribution ranges of the species. Nonetheless, it is mentioned that the situation should be carefully monitored and that mitigation measures are to be strictly adhered to. Simmons & Martins (2018) noted that the proposed Witberg WEF would likely show main concerns for the Verreaux's Eagle species present on site. However, after a proposed layout change, it was determined that the likely number of estimated fatalities would decrease to about 0.72 eagles per year, and that if suitable mitigation measures were implemented, then the project would be deemed acceptable for development. These reports were also broadly used in the assessment of potential cumulative impacts.

Based on the sources above, priority species nests from outside of the proposed Rondekop WEF were also mapped relative to the proposed development envelope. As one can see from Figure 5, the nearest known priority species nest is that belonging to a Verreaux's Eagle (14.8 km south-east of the nearest turbine). A Martial Eagle nest can be observed 39.9 km east from the nearest turbine, while a Secretarybird nest can be seen 41.1 km north-east of the nearest turbine. As per the most recent Verreaux's Eagle guidelines for impact assessments, monitoring and mitigation (Birdlife South Africa, 2017), no construction is allowed to take place within 1 km of a known nest during its breeding season. Similarly, all active nests (including alternate nests) are to receive a 3 km buffer where no construction is allowed to take place. As the nearest known nest occurs 14.8 km south-east of the nearest turbine, it is noted that this distance is considered acceptable in terms of reducing the likely negative impact on the breeding pair.

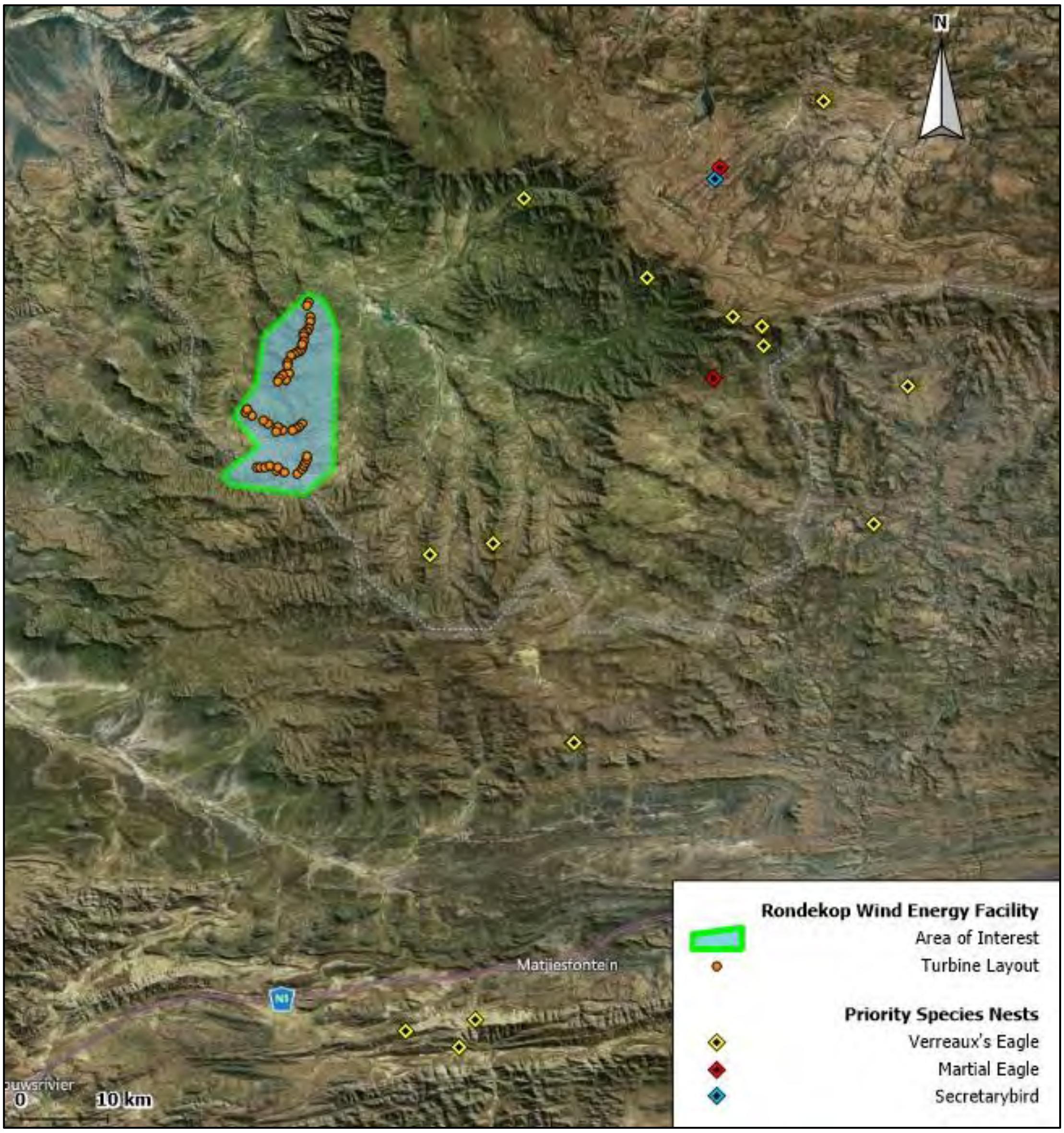

Figure 5 - Priority species nests relative to Rondekop WEF (based on information from surrounding projects).

1.4 APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

It is considered best practise for bird monitoring to be undertaken on wind energy facility sites, in order to fulfil the requirements outlined by the "Best- Practice Guidelines for assessing and monitoring the impact of wind-energy facilities on birds in southern Africa" (Jenkins *et al*., 2015).

There are no permit requirements dealing specifically with birds in South Africa. However, legislation which applies to birds includes the following:

National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004):

Sections 2, 56 and 97 are of specific reference. Section 97 considers the Threatened or Protected Species Regulations: The Act calls for the management and conservation of all biological diversity within South Africa.

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected.

NEMBA also deals with endangered, threatened and otherwise controlled species, under the ToPS Regulations (Threatened or Protected Species Regulations). The Act provides for listing of species as threatened or protected, under one of the following categories:

- Critically Endangered: any indigenous species facing an extremely high risk of extinction in the wild in the immediate future.
- Endangered: any indigenous species facing a high risk of extinction in the wild in the near future, although it is not a critically endangered species.
- Vulnerable: any indigenous species facing an extremely high risk of extinction in the wild in the medium-term future; although it is not a critically endangered species or an endangered species.
- Protected species: any species which is of such high conservation value or national importance that it requires national protection. Species listed in this category include, among others, species listed in terms of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

A ToPS permit is required for any activities involving the removal or destruction of any ToPS-listed species.

Northern Cape Nature Conservation Act, 2009 (Act No 9 of 2009)

At a Provincial level, birds are protected by Northern Cape Department of Environment and Nature Conservation (DENC) under the National Environmental Management: Biodiversity Act (see above). In addition, provincially protected and specially protected species are listed in the Northern Cape Nature Conservation Act, 2009 (Act No 9 of 2009).

IUCN Red List of Threatened Species

The International Union for the Conservation of Nature (IUCN) Red List of Threatened Species ranks plants and animals according to threat levels and risk of extinction, thus providing an indication of biodiversity loss. This has become a key tool used by scientists and conservationists to determine which species are most urgently in need of conservation attention. In South Africa, a number of birds are listed on the IUCN Red List.

Convention on Biological Diversity

This Convention aims to protect and maintain biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits from the use of genetic resources. The Convention intends to enforce the concept of sustainable use of resources among decision-makers and that these are not infinite. It also offers decision-makers guidance based on the precautionary principle. South Africa is a Party of this convention since 1993.

Convention on the Conservation of Migratory Species of Wild Animals (CMS)

CMS is a treaty of the United Nations Environment Programme (UNEP), which provides a global platform for the conservation and sustainable use of migratory animals and their habitats. South Africa is a Party State since 1991. CMS includes the States through which migratory animals pass (Range States) and establishes the legal foundation for internationally coordinated conservation measures throughout a migratory range. Besides establishing obligations for each State joining the Convention, CMS promotes concerted action among the Range States of many of these species.

The CMS has two Appendices: Appendix I pertains to migratory species threatened with extinction and Appendix II that regards migratory species that need or would significantly benefit from international co-operation. CMS Parties strive towards strictly protecting these animals, conserving or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them.

African-Eurasian Waterbird Agreement (AEWA)

The Agreement on the Conservation of African-Eurasian Migratory Waterbirds was established under the CMS and administered by the UNEP. It is an intergovernmental treaty focused on the conservation of migratory waterbirds and their habitats across their occurrence range. South Africa is a contracting party since 2002. The Agreement requires that the habitat of the species covered by the AEWA are in good quality for breeding, and therefore it is essential for the signatory countries to have concerted efforts in the conservation and management of these migratory populations.

1.5 IDENTIFICATION OF KEY ISSUES

1.5.1 Key Issues Identified

The potential avifaunal issues identified include:

- Habitat Destruction.
- Disturbance and/or Displacement effects.
- Fatalities due to collision with the projects' infrastructures.

To date, the project has undergone a 30-day review period for the Draft Scoping Report which ended on the 14th December 2018. . Additionally, SiVEST will provide all stakeholders with the opportunity to comment further on the Draft Impact Assessment Report which will be released for a 30-day commenting period.

1.5.2 Identification of Potential Impacts

Considering the species with potential occurrence at the Rondekop WEF, the main potential impacts identified during the IA assessment are:

1.5.2.1 Construction Phase

- Direct Impacts
  - Habitat Loss
  - Disturbance Effects
- Indirect Impacts
  - Displacement to other areas which may or may not have the ability to support the influx of species

1.5.2.2 Operational Phase

- Direct Impacts
  - Fatalities due to collision with the wind turbines and other project infrastructure
  - Disturbance Effects
- Indirect Impacts
  - Displacement to other areas which may or may not have the ability to support the influx of species

1.5.2.3 Decommissioning Phase

- Direct Impacts
  - Disturbance Effects
- Indirect Impacts
  - Displacement to other areas which may or may not have the ability to support the influx of species

1.5.2.4 Cumulative impacts

- Increased Habitat Loss
- Increased fatalities due to collision with wind turbines and other project infrastructure
- Increased disturbance/displacement effects

1.6 ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

1.6.1 Main Results of the Field Study

From a total of 131 species potentially occurring in the area (Bioinsight, 2018), 67 bird species were detected within the study area (WEF and surrounding area) across all the survey methodologies implemented through the pre-construction monitoring, including eight species that were not identified to occur at the site during the monitoring campaign. Seventeen of the species identified are considered priority species for the monitoring campaign (Table 1).

Out of the total species identified, 6 are of special concern for having an unfavourable conservation status in South Africa: Black Harrier *Circus maurus*, Ludwig's Bustard *Neotis ludwigii*, Martial Eagle *Polemaetus bellicosus* – Endangered; Verreauxs' Eagle *Aquila verreauxii*, Black Stork *Ciconia nigra* – Vulnerable; Greater Flaming *Phoenicopterus roseus* – Near Threatened (Taylor *et al*., 2015). Of these six (6) species, five (5) were observed within the wind farm boundaries. The Verreaux's Eagle was detected in summer, winter and spring, and had individuals gliding at high altitudes. The Black Harrier was observed during winter and spring. Of all observations recorded, three were detected at rotor swept height and demonstrating risk behaviours. Ludwig's Bustard was only observed once during the spring season and was observed using the airspace below the rotor swept zone. Martial Eagle was detected as incidental observations during summer, autumn and winter. About half of all observations were recorded at rotor swept height. Lastly, two individuals of Black Stork were observed during winter and spring, of which both flights occurred within the rotor swept zone.

A map showing the flight paths of all sensitive species (irrespective of conservation status) is shown in figure 6 below.

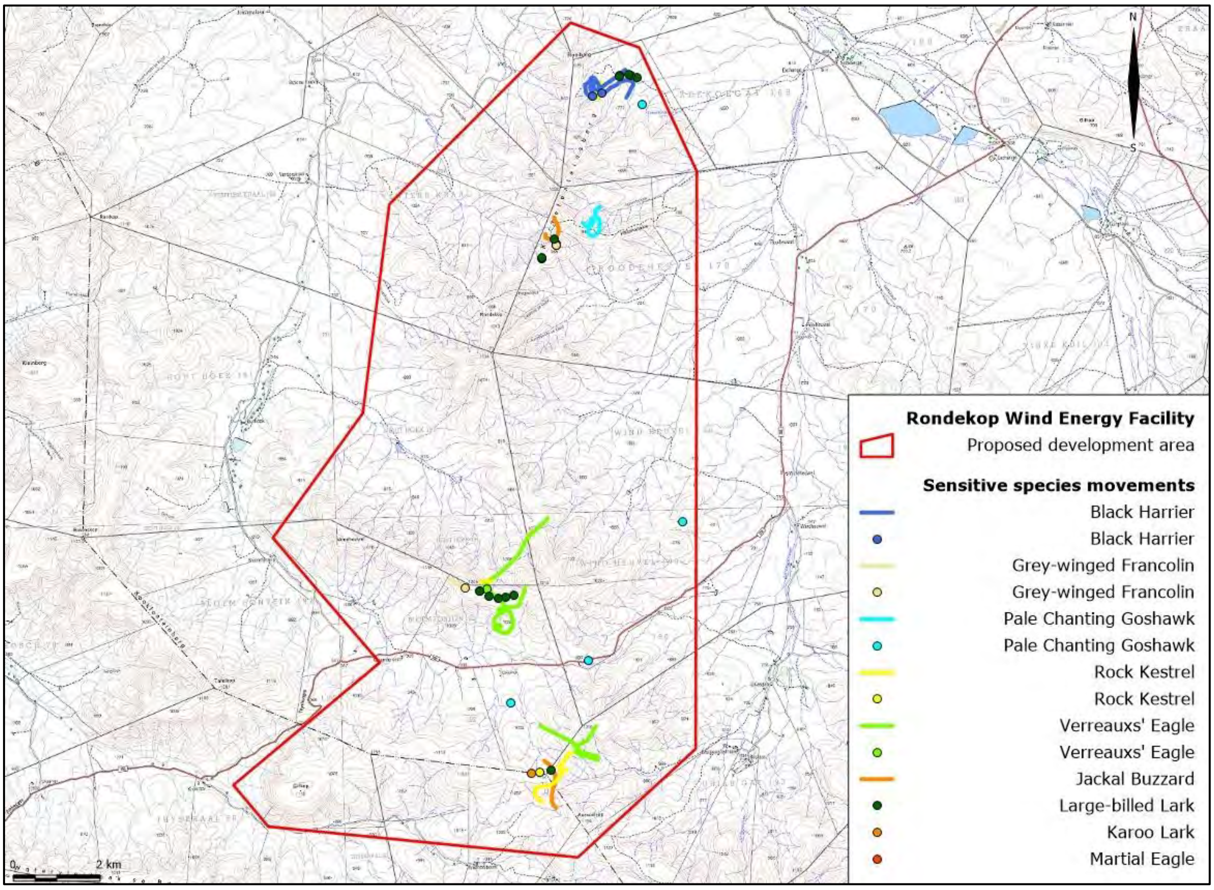

Figure 6 - Observed movements of sensitive species during the pre-construction bird monitoring programme at Rondekop WEF.

Eleven species detected during field work are considered to be endemic or near endemic to South Africa including sensitive species such as Jackal Buzzard, Karoo Lark, Black Harrier, Large-billed Lark and Cape Clapper Lark.

The bird community in the study area (67 total bird species) is mostly comprised of passerine and small bird species (43% of the total species), followed by bird species associated with waterbodies (28% of the total bird species), Accipitrids (10% of species) and Ciconids (10% of species). Representing a smaller proportion, 7% of the species found in the study area were Bustards, Falcon or Crow species. From the aforementioned groups, the Raptors (Accipitrids), Falcons, Waterbirds and "Ciconids" are considered most likely to suffer impacts caused by wind farms (Retief *et al*., 2012). Passerines might also be sensitive to impacts and collide with wind turbines, especially those which are known to migrate (AWWI, 2015).

A large portion of the species confirmed in the area were observed in both the proposed wind energy facility site and the surrounding area (33 species – 49% of the total species observed). These species may not be severely impacted by the presence of the wind energy facility as they already use the surrounding area, making it possible for them to therefore have an ability to potentially shift their utilisation area slightly. This includes most of the priority species present at the site (12 out of 17 species), of which 7 are Accipitrids and Falcons species, considered to have a higher vulnerability to collision, especially if using the area of development only (AWWI, 2015).

Thirteen (13) of the remaining species were observed using only the WEF site, with most of them being from the Waterbird, Ciconid and Passerine groups. Of these 13 species, only two (2) are considered sensitive to impacts caused by wind energy facilities.

A similar number of species were detected using only the Control area, with similar group characteristics. Such species are considered to be less likely negatively impacted by the Rondekop WEF as they do not regularly use the area where the WEF will be constructed. They may however be somewhat affected by the disturbance caused by the temporary construction activities which can have repercussions to the broader study area.

In terms of risk analysis, it usually takes into account the movements observed in the area which could lead to future collisions with wind turbines, both considering proposed turbine placement and technical specifications (such as rotor height). With present knowledge of the proposed turbine layouts and dimensions, a preliminary analysis is illustrated below and provides an indication of the location where sensitive species fly relative to rotor height, taking into consideration one year of observations (Figure 7, Figure 8 & Figure 9). One can observe that activity indexes are relatively low at heights **above rotor height**, averaging at <0.05 contacts per hour throughout the year. This value is considered very low and will unlikely cause high collision risk probabilities (Figure 7). Similarly, all sensitive species flights **at rotor swept height** are also relatively low, with activity indexes averaging between 0.05 and 0.1 contacts per hour throughout the year. There were however important flights (Rock Kestrel and Black-chested Snake Eagle individuals) recorded at this height, with high activity indexes (>0.25 contacts/hour) occurring in two 500x500m squares (Figure 8). However, it is important to note that none of these squares occur within the proposed WEF, but rather on the control site. As such, they are not considered significant enough to inform sensitivity of the Rondekop WEF at this stage. Lastly, regarding the flights of sensitive species **below rotor swept height**, we find that there are two areas where activity indexes are relatively high (>0.25 contacts/hour) (Figure 9). These two areas would normally be considered as being very highly sensitive due to the relatively higher activity levels. However, upon further analysis we find that these areas were only used by three Grey-winged Francolin individuals – which is a species that is not known to ever fly at rotor swept height (Hockey, Dean & Ryan 2005). As such, due to the low abundances observed and the lack of evidence to suggest turbine blade collision risks, these areas are not to be considered as no-go areas, but rather only as medium-sensitive areas.

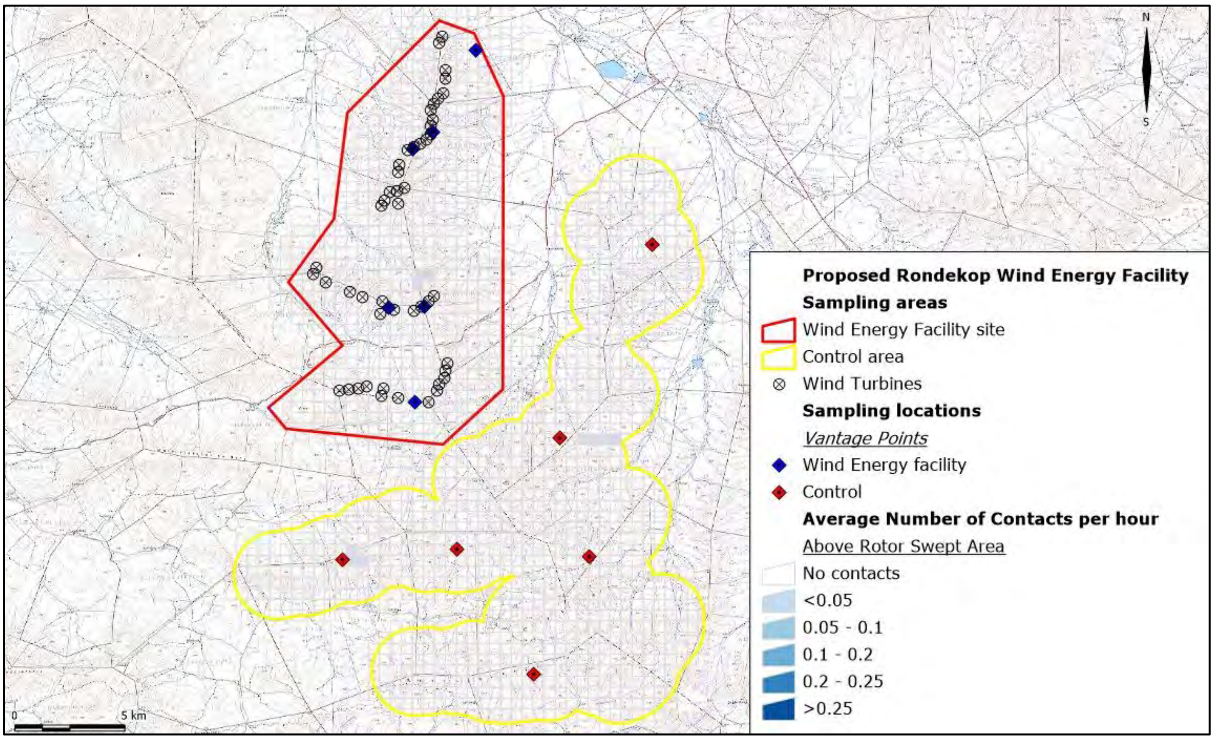

Figure 7 - Average activity of sensitive species recorded above RSA through vantage points during the 12-month pre-construction bird monitoring programme.

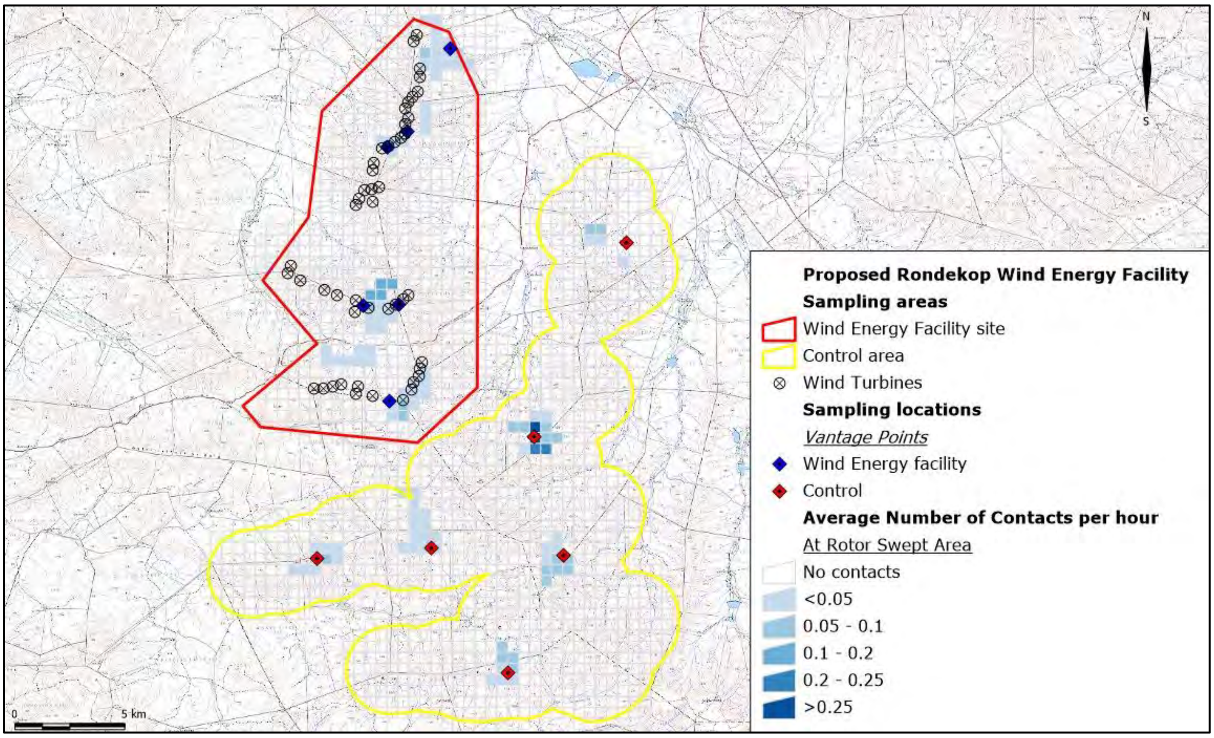

Figure 8 - Average activity of sensitive species recorded at RSA through vantage points during the 12-month pre-construction bird monitoring programme.

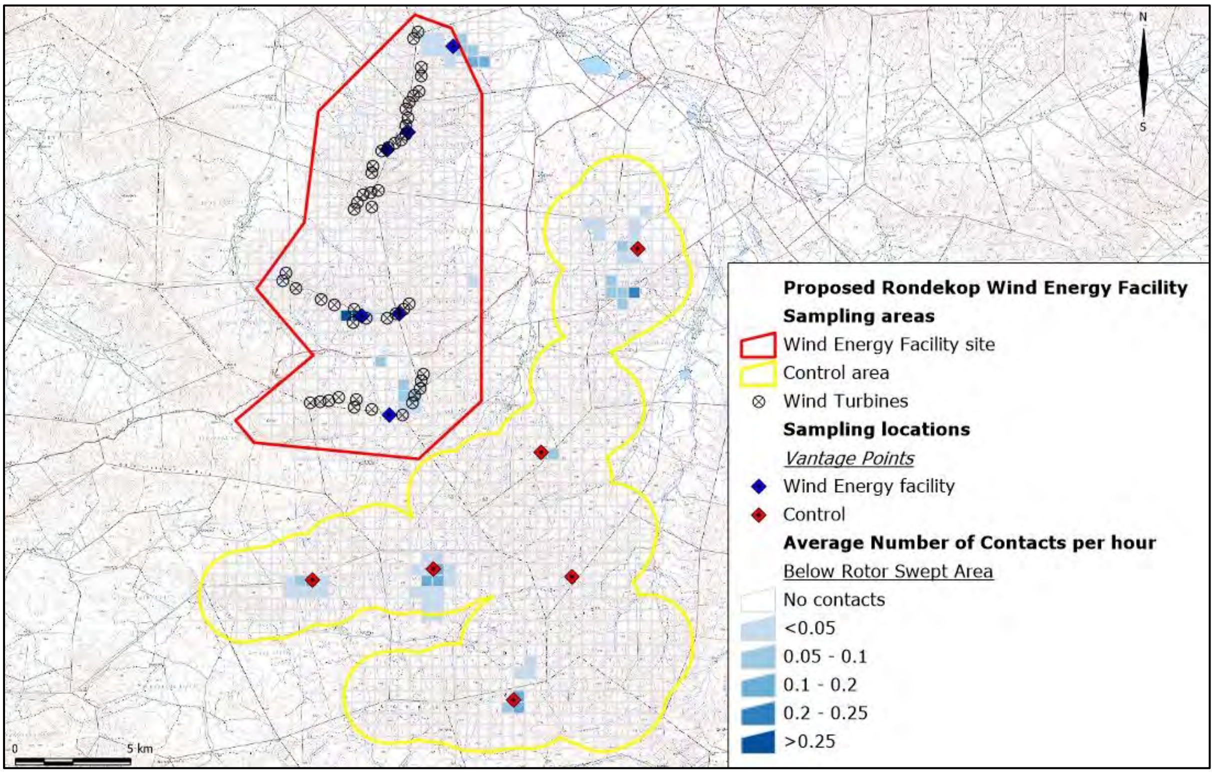

Figure 9 - Average activity of sensitive species recorded below RSA through vantage points during the 12-month pre-construction bird monitoring programme.

1.6.2 Habitat Loss (Construction Phase)

- Nature: Destruction of natural vegetated areas due to platforms construction, workstation and substation construction, internal access roads construction, and turbines, underground cabling and overhead power lines installation and other infrastructure – **negative impacts**.
- Significance of impact without mitigation measures: Relating to habitat loss, it is expected to be of **low** significance as the WEF footprint is not very large.
- Proposed mitigation measures: The minimisation of this impact is mainly achieved in the project design phase through the avoidance of new infrastructure siting (especially wind turbines and substations) in very high (no-go) areas. Additionally, in affected areas, activities of clearance and removal of vegetation should be kept to a minimum. The use of existing access roads should be used to the maximum extent possible. If large portions of very high sensitive areas are affected during the construction phase, then measures should be taken to restore vegetation as soon as possible after construction has completed. The area of intervention should be identified and delimitated prior to the beginning of the work.
- Significance of impact with mitigation measures: In spite of the mitigation measures, impacts cannot be completely prevented from occurring. However, the magnitude and significance of these effects can be minimised to a high degree, with mitigation measures in place. As such, habitat loss is considered to have an impact of **low** significance, following mitigation.

1.6.3 Disturbance / Displacement Effects (Construction Phase)

- Nature: Disturbance / displacement of the bird community due to the increase of people and vehicles in the area – **negative impacts**.
- Significance of impact without mitigation measures: The disturbance due to people and vehicle presence is considered an impact of **medium** significance.
- Proposed mitigation measures: In order to minimise this impact, certain measures can be taken, such as to avoid or minimise the presence of people and vehicles in the very high (no-go) areas as much as possible. Noise levels should be kept to a minimum as far as possible.
- Significance of impact with mitigation measures: In spite of the mitigation measures, impacts cannot be completely prevented from occurring. However, the magnitude and significance of these effects can be minimised to a high degree, with mitigation measures in place. As such, disturbance effects are considered to have an impact of **low** significance, following mitigation.

1.6.4 Fatalities due to collision (Operational Phase)

- Nature: Fatality of individuals due to collision with turbine blades or associated infrastructure – **negative impacts**.
- Significance of impact without mitigation measures: Considering the potential risk of fatality of birds in the study area, due to the presence of collision-prone species, this impact is considered to have a **medium** level of significance, with a sure probability of occurrence.
- Proposed mitigation measures: The minimisation of fatalities is mainly achieved through planning during the layout definition phase. For example: Avoidance of turbine installation in very high sensitive areas for birds, and avoidance of overhead powerlines being built to run perpendicularly to known bird flight paths / migratory routes. These powerlines are however allowed to be built within sensitive buffered locations, as long as they only run parallel to bird flight paths. This is to be further assessed for approval by the avifaunal specialist once the powerline layout becomes available which will be subject to a separate environmental process. Powerlines and guyed wires from meteorological masts should be fitted with bird flight diverters, to allow them to be more visible to bird species. All above-ground powerline infrastructure must be signed off

as "bird-friendly" by the avifaunal specialist prior to construction. Considering the bird movements observed, it is recommended that the turbine minimum height of the rotor swept area is not lower than 40 m. In addition to that, all turbines should be treated as having a 200 m 'area of influence' buffer around them. This buffer is merely to illustrate an area where birds are likely to show behavioural changes in relation to the distance to wind turbines. However, it must be noted that the more relevant distance to influence turbine placement would be an area of 90m (maximum length of a turbine blade) around each wind turbine (the impact zone). As such, all turbines sited outside of no-go areas, should also not be located within a distance of 90m of these sensitive areas. Lastly, a monitoring plan is recommended during the construction and operational phase to improve the understanding of the real impact caused by the WEF on local bird populations, as well as to validate the success of the mitigation measures proposed.

- Significance of impact with mitigation measures: If mitigation measures are successfully implemented, then it is expected that the impact can be lowered to a degree that will have a **low** significance with mitigation.

1.6.5 Disturbance / Displacement Effects (Operational Phase)

- Nature: Disturbance / displacement of the bird community due to noise and movement generated by turbines, as well as an increase of people and vehicles in the area during maintenance activities – **negative impacts**.
- Significance of impact without mitigation measures: The disturbance due to operational turbines and people / vehicles in the area is considered to be an impact of **medium** significance. Generally, the people/vehicles on site (for maintenance activities) are not expected to cause a significant increased effect with regards to disturbance, as the area already has some movement through the site due to the presence of a major national gravel road, as well as farm roads & houses coupled with existing farming activities. However, the more relevant disturbance effect would be that which is derived from the newly sited wind turbines. These are structures that the local bird community will not be familiar with, and as such, some degree of impact is expected.
- Proposed mitigation measures: In order to minimise this impact, certain measures can be taken. Lower levels of traffic and noise disturbance is recommended whenever possible, and speed limits of 40km/h (maximum) should always be adhered to.
- Significance of impact with mitigation measures: In spite of the mitigation measures, impacts cannot be completely prevented from occurring. However, the magnitude and significance of these effects can be minimised to a high degree, with mitigation measures in place. As such, disturbance effects are considered to have an impact of **low** significance.

1.6.6 Disturbance / Displacement Effects (Decommissioning Phase)

- Nature: Disturbance / displacement of the bird community due to the increase of people and vehicles in the area, while dismantling wind turbines and associated infrastructures – **negative impacts**.
- Significance of impact without mitigation measures: The disturbance due to people and vehicle presence is considered an impact of **low** significance due to the temporary nature and very restricted area of the impact – being that of a local extent.
- Proposed mitigation measures: In order to minimise this impact, certain measures can be taken. Lower levels of noise disturbance are recommended whenever possible and adhere to speed limits of 40km/h (maximum). Keep decommissioning phase as short as possible.
- Significance of impact with mitigation measures: In spite of the mitigation measures, impacts cannot be completely prevented from occurring. However, the magnitude and significance of these effects can be minimised to a high degree, with mitigation measures in place. As such, disturbance/displacement effects are considered to have an impact of **low** significance following mitigation.

1.6.7 Cumulative Impacts

- Nature: The effects of the Rondekop WEF, considering other projects, will produce impacts that are likely to impact on the bird communities, on a broader scale – **negative impacts**. Although wind energy facilities' footprints are not that intense, the construction of roads and building platforms can affect relatively large portions of natural vegetation. Also, it is important to consider that other renewable energy facilities which therefore leads to increased destruction of habitats. Such facilities have also been planned and approved in the proximities of the Rondekop WEF (Figure 10).
- Significance of impact without mitigation measures:
    - Cumulative impacts relating to habitat loss are expected to be of **low** significance, as the footprint of the Rondekop WEF is relatively small, even when considered against the footprint of surrounding projects.
    - Cumulative impacts relating to disturbance/displacement effects are expected to be of **medium** significance, as an increase in human presence and turbine operation across all facilities may disrupt the general pristine environment and habitats of several bird species in the broader region.
    - Cumulative impacts relating to fatalities due to collision are expected to be of **medium** significance, as wind energy facilities nearby or adjacent to one another are known to increase the likelihood of collision, due to the establishment of a relatively increased risk area.
- Proposed mitigation measures: Avoid infrastructure siting, especially turbines (including the 90 m 'impact zone' areas around each turbine), in very high sensitive areas (i.e. no-go areas). Keep all noise disturbance to a minimum, especially near areas that have been defined as being sensitive. The use of existing access routes must be used as far as possible during construction. Considering the likelihood of displaying passerines in the Karoo area, it is recommended that the turbine minimum rotor swept height is not lower than 40 m. A monitoring plan is recommended during the construction and operational phase to improve the understanding of the real impact caused by the WEF on local bird populations, as well as to validate the success of the mitigation measures proposed.
- Significance of impact with mitigation measures: Mitigation measures are designed to lower the magnitude and significance of impacts. Assuming mitigation measures at the Rondekop WEF (and preferably at all facilities) are correctly implemented, it is expected that the cumulative impacts on the general bird community will have a **low** significance following mitigation.

It is however important to note that the quantification or even evaluation of cumulative impacts is uncertain as there is not a generalised knowledge of large-scale movements or connection between bird populations within the region. If present, cumulative impacts will be reflected by a very rapid decline of bird populations, i.e. above that which is expected from a single wind energy facility operation. Further monitoring and meta-analysis of the results of the monitoring programmes of all operational phase WEF's and PVSEF's will help validate and determine these types of impacts. However, this is out of the scope of this EIA. In terms of the mitigation proposed for this project, we find that the recommendations are broadly similar to those assessed in surrounding projects (which are already considered in this report) (Bioinsight 2018; Endangered Wildlife Trust 2012; Jenkins A. 2011; Simmons & Martins 2018; Williams 2013, 2014, 2016, 2016; van Rooyen 2016, 2016, 2016).

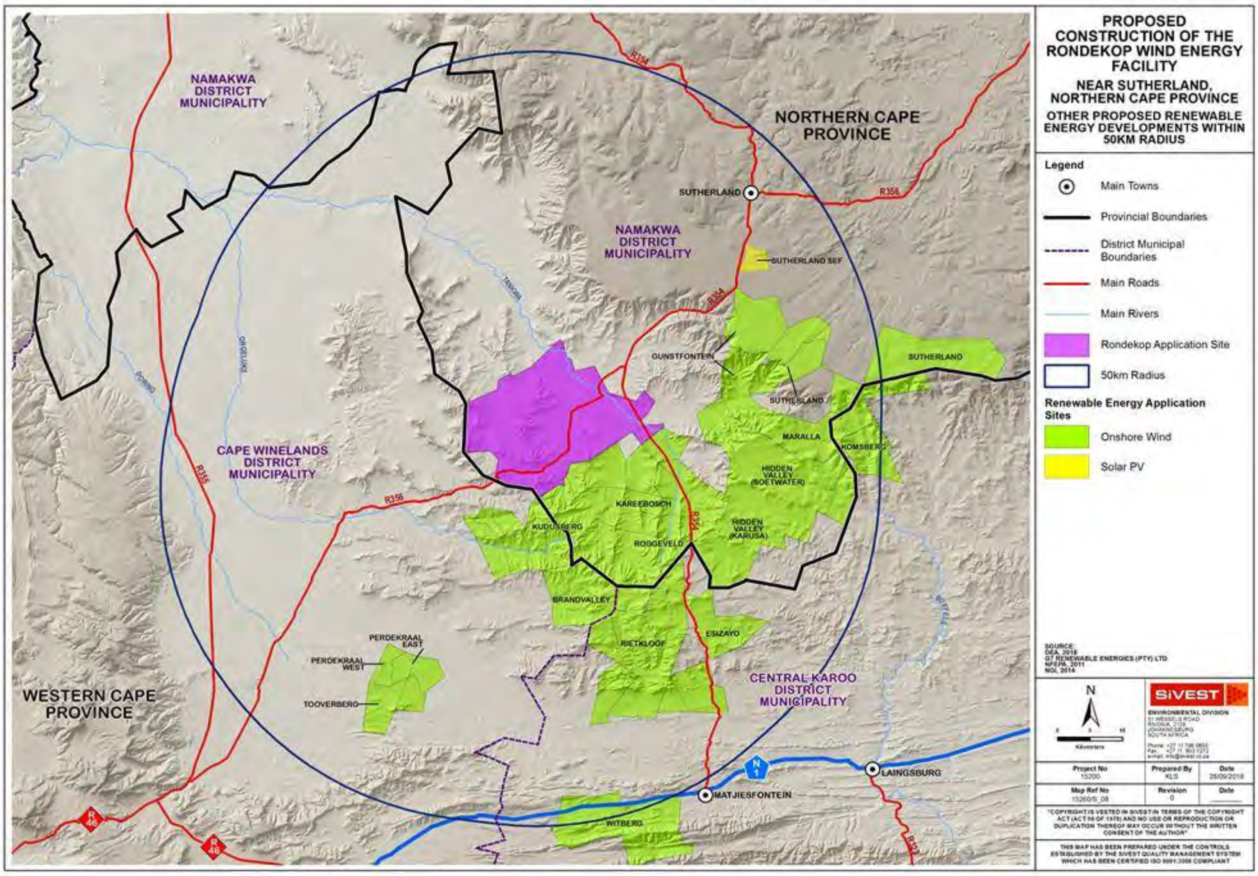

Figure 10 - Onshore Renewable Energy projects currently proposed or approved in the surrounding area of the Rondekop Wind Energy Facility (according to the REEA most recent available dataset – 2018 4th Quarter) (Map provided by SiVEST).

1.6.8 No-go Alternative

Should the Rondekop Wind Farm not be constructed, then all impacts (whether it be negative or positive) identified within the impact analysis will not take place. As a result, it is expected that the present environmental characteristics relevant for the bird community on site will remain unchanged, relative to that which is currently being observed at present, under current land-use practices.

1.7 IMPACT ASSESSMENT SUMMARY

The assessment of impacts and recommendations of mitigation measures, as discussed above, are collated in Tables 3 to 10 below.

Table 3 - Impact assessment summary table for the Planning Phase

PLANNING PHASE
No impacts are considered to occur during the planning phase. However, careful planning and certain avoidance measures must still be taken into account during this stage already – in order to prepare for subsequent phases to follow. This is further described in section 1.8.

Table 4 - Impact assessment summary table for the Construction Phase

CONSTRUCTION PHASE		
Environmental Parameter	*Habitat Loss*	
Issue/Impact/Environmental Effect/Nature	*Destruction of important habitat areas (natural vegetation & water features etc.) due to the construction of wind turbines and associated infrastructures.*	
Extent	*Site*	
Probability	*Probable*	
Reversibility	*Partly Reversible*	
Irreplaceable loss of resources	*Marginal loss of resource*	
Duration	*Long term*	
Cumulative effect	*Negligible Cumulative Impact*	
Intensity/magnitude	*Medium*	
Significance Rating	*Habitat loss will have negligible negative effects and will require little to no mitigation.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	1
Reversibility	2	1
Irreplaceable loss	2	2
Duration	3	2
Cumulative effect	1	1
Intensity/magnitude	2	2
Significance rating **[(extent + probability + reversibility + irreplaceability + duration + cumulative] x magnitude/intensity]**	-24 (low negative)	-16 (low negative)
Mitigation measures	*Avoidance of new infrastructure siting (especially wind turbines) in high sensitivity areas. Clearance and removal of vegetation should be kept to a minimum. Clearance and removal of vegetation should be kept to a minimum. Vegetation restoration should take place after construction, if significant sensitive areas are affected.*	

Table 5 - Impact assessment summary table for the Construction Phase

CONSTRUCTION PHASE		
Environmental Parameter	*Disturbance/Displacement Effects*	
Issue/Impact/Environmental Effect/Nature	*Disturbance/displacement of the bird community due to the increase of people and vehicles in the area.*	
Extent	*Local/district*	
Probability	*Probable*	
Reversibility	*Partly Reversible*	
Irreplaceable loss of resources	*Marginal loss of resource*	
Duration	*Long Term*	
Cumulative effect	*Medium Cumulative Impact*	
Intensity/magnitude	*Medium*	
Significance Rating	*The project will have a moderate negative effect on disturbance/displacement effects and will require moderate mitigation measures.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	1
Probability	3	2
Reversibility	2	1
Irreplaceable loss	2	1
Duration	3	2
Cumulative effect	3	2
Intensity/magnitude	2	2
Significance rating **[(extent + probability + reversibility + irreplaceability + duration + cumulative] x magnitude/intensity]**	-30 (medium negative)	-18 (low negative)
Mitigation measures	*Avoid/minimise the presence of people and vehicles in highly sensitive areas as much as possible. Low levels of noise disturbance are recommended wherever possible. An avifaunal monitoring campaign is recommended for at least one year during the construction phase.*	

Table 6 - Impact assessment summary table for the Operational Phase

OPERATIONAL PHASE		
Environmental Parameter	*Fatalities due to collision*	
Issue/Impact/Environmental Effect/Nature	*Fatalities due to collision with wind turbine blades or associated infrastructures.*	
Extent	*Site*	
Probability	*Probable*	
Reversibility	*Irreversible*	
Irreplaceable loss of resources	*Significant loss of resources*	
Duration	*Long Term*	
Cumulative effect	*Medium Cumulative Impact*	
Intensity/magnitude	*High*	
Significance Rating	*The anticipated impact will have moderate negative effects and will require moderate mitigation measures.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	2	1
Reversibility	3	2
Irreplaceable loss	3	2
Duration	3	3
Cumulative effect	3	2
Intensity/magnitude	3	2
Significance rating **[(extent + probability + reversibility + irreplaceability + duration + cumulative] x magnitude/intensity]**	-45 (medium negative)	-22 (low negative)
Mitigation measures	*Avoid turbine placement in no-go areas. Overhead powerlines must be fitted with bird flight diverters and may not run perpendicularly to any known bird flight paths. All above-ground powerline infrastructure must be signed off as "bird-friendly" by the avifaunal specialist, prior to construction. Lower blade tip should not be lower than 40m. A monitoring programme (including carcass searches and bias/scavenger trials) is recommended for a minimum of two years during the operational.*	

Table 7 - Impact assessment summary table for the Operational Phase

OPERATIONAL PHASE		
Environmental Parameter	*Disturbance/Displacement Effects*	
Issue/Impact/Environmental Effect/Nature	*Disturbance/displacement of the bird community due to noise and movement generated by turbines and people/vehicles operating in the area.*	
Extent	*Local/district*	
Probability	*Probable*	
Reversibility	*Partly Reversible*	
Irreplaceable loss of resources	*Marginal loss of resource*	
Duration	*Long Term*	
Cumulative effect	*Medium Cumulative Impact*	
Intensity/magnitude	*Medium*	
Significance Rating	*The project will have a moderate negative effect on disturbance/displacement effects and will require moderate mitigation measures.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	1
Probability	3	2
Reversibility	2	1
Irreplaceable loss	2	1
Duration	3	2
Cumulative effect	3	2
Intensity/magnitude	2	2
Significance rating **[(extent + probability + reversibility + irreplaceability + duration + cumulative] x magnitude/intensity]**	-30 (medium negative)	-18 (low negative)
Mitigation measures	*Lower the noise levels and traffic movement as far as possible.*	

Table 8 - Impact assessment summary table for the Decommissioning Phase

DECOMMISSIONING PHASE		
Environmental Parameter	*Disturbance/Displacement Effects*	
Issue/Impact/Environmental Effect/Nature	*Disturbance/displacement of the bird community due to the increase of people and vehicles in the area, when dismantling wind turbines and associated infrastructures.*	
Extent	*Site*	
Probability	*Probable*	
Reversibility	*Partly Reversible*	
Irreplaceable loss of resources	*Marginal loss of resource*	
Duration	*Short term*	
Cumulative effect	*Low Cumulative Impact*	
Intensity/magnitude	*Medium*	
Significance Rating	*Disturbance/Displacement effects will have negligible negative effects and will require little to no mitigation.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	2
Reversibility	2	1
Irreplaceable loss	2	1
Duration	1	1
Cumulative effect	2	1
Intensity/magnitude	2	1
Significance rating **[(extent + probability + reversibility + irreplaceability + duration + cumulative] x magnitude/intensity]**	-22 (low negative)	-14 (low negative)
Mitigation measures	*Lower the noise levels and traffic movement as far as possible. No off-road driving. Adhere to speed limits on site (40 km/h). Keep decommissioning phase as short as possible.*	

Table 9 - Impact assessment summary table for cumulative assessments

CUMULATIVE IMPACTS		
Environmental Parameter	*Disturbance/Displacement Effects; Habitat Loss; Fatalities due to Collision*	
Issue/Impact/Environmental Effect/Nature	*Disturbance/displacement of the bird community due to the presence of wind turbines and the increase of people and vehicles in the area, when operating the facilities. Habitat loss as a result of the removal of natural vegetation when constructing the facilities. Fatalities when each facility experiences bird collisions with wind turbines.*	
Extent	*Province/region*	
Probability	*Probable*	
Reversibility	*Partly Reversible*	
Irreplaceable loss of resources	*Significant loss of resource*	
Duration	*Long term*	
Cumulative effect	*Medium Cumulative Impact*	
Intensity/magnitude	*Medium*	
Significance Rating	*These impacts will likely have moderate negative effects and will require moderate mitigation measures.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	3	3
Probability	3	3
Reversibility	3	2
Irreplaceable loss	3	2
Duration	3	2
Cumulative effect	3	2
Intensity/magnitude	2	2
Significance rating **[(extent + probability + reversibility + irreplaceability + duration + cumulative] x magnitude/intensity]**	-36 (medium negative)	-28 (low negative)
Mitigation measures	*Lower the noise levels and traffic movement as far as possible. Avoid turbine placement in no-go areas. Clearance and removal of vegetation should be kept to a minimum. Vegetation restoration should take place after construction, if significant sensitive areas are affected. Overhead powerlines must be fitted with bird flight diverters and may not run perpendicularly to any known bird flight paths. All above-ground powerline infrastructure must be signed off as "bird-friendly" by the avifaunal specialist, prior to construction. Lower blade tip should not be lower than 40m. A monitoring programme (including carcass searches and bias/scavenger trials) is recommended for a minimum of two years during the operational.*	

Table 10 - Impact assessment summary table for the no-go alternative

NO-GO ALTERNATIVE		
Environmental Parameter	*Disturbance/Displacement Effects; Habitat Loss; Fatalities due to Collision (although these impacts will not occur if the facility is not built)*	
Issue/Impact/Environmental Effect/Nature	*Disturbance/displacement of the bird community due to the presence of wind turbines and the increase of people and vehicles in the areas, when operating the facilities. Habitat loss as a result of the removal of natural vegetation when constructing the facilities. Fatalities when each facility experiences bird collisions with wind turbines. (although these impacts will not occur if the facility is not built)*	
Extent	*Site (although it will not have any extent due to the absence of the facility)*	
Probability	*Unlikely (as the facility would not be built)*	
Reversibility	*Completely Reversible (although the impacts would not occur in the first place)*	
Irreplaceable loss of resources	*No loss of resource (as the facility will not exist, and impacts will not occur)*	
Duration	*Short term (as impacts will not occur)*	
Cumulative effect	*Negligible Cumulative Impact (as the facility will not exist – meaning that no impacts can exacerbate the impacts experienced in surrounding projects)*	
Intensity/magnitude	*Low (as impacts will not exist, and therefore the quality, use and integrity of the system will not be affected in any way)*	
Significance Rating	*As the project will not exist, the significance would be that of a neutral nature with no actual "impact" occurring (i.e. not a positive or negative impact).*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	N/A
Probability	1	N/A
Reversibility	1	N/A
Irreplaceable loss	1	N/A
Duration	1	N/A
Cumulative effect	1	N/A
Intensity/magnitude	1	N/A
Significance rating **[(extent + probability + reversibility + irreplaceability + duration + cumulative] x magnitude/intensity]**	6 (neutral)	
Mitigation measures	*No-go alternatives can't properly be assessed in this context. Regardless, if the project does not get constructed, then impacts are expected to remain completely unchanged than what they presently are in their current state (no impacts). Therefore, the significance would be of a neutral nature. No mitigation measures would be required to be implemented for the absence of this facility.*	

1.8 INPUT INTO THE ENVIRONMENTAL MANAGEMENT PROGRAMME

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
A. DESIGN PHASE					
A.1. AVIFAUNA IMPACTS					
Potential impacts on avifauna (as a result of the proposed Rondekop WEF and associated infrastructures) in future project phases, such as loss of habitat, fatality due to collision, disturbance, displacement and population decline.	Avoid or minimise the impacts on the avifauna present on site.	▪ Ensure that the design of the WEF takes the sensitivity mapping of the avifauna specialist into account to avoid and/or reduce the impacts on Species and habitats of Conservation Concern. ▪ Avoid siting wind turbines (including the 90 m 'impact zone' around each turbine) in areas identified as being highly sensitive. ▪ Lowest tip of turbine blades should not be lower than 40m. ▪ Regarding the above, minimise the footprint of the construction to an acceptable level, as defined by the avifaunal specialist. ▪ Use existing road networks as far as possible.	▪ Ensure that the design of the WEF takes the sensitivity mapping of the avifauna specialist into account to avoid and reduce impacts of avifauna species and important features.	▪ During design cycle and before construction commences.	▪ Holder of the EA.

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
B. CONSTRUCTION PHASE					
B.1 AVIFAUNA IMPACTS					
Habitat loss	Reduce the extent of habitat destruction caused by the clearings for the working areas, to only the extent required.	▪ An ECO should be appointed to oversee that the EMP is being adhered to. ▪ ECO Training & Education of bird and energy related impacts. ▪ Clearance and removal of natural vegetation should be kept to a minimum. ▪ Provide sufficient drainage along access roads to prevent erosion and pollution of adjacent watercourses or wetlands. No chemical spills or any other material dumps should be allowed within the WEF implementation area, with special focus on areas nearby riparian vegetation or drainage lines. ▪ No off-road driving. ▪ Implement speed limits (max 40km/h).	▪ Monitor the efficiency of the EMP and revise, if necessary. Also monitor whether proposed measures are being adhered to or not. ▪ The ECO should be trained to identify priority bird species, as well as their breeding habits/locations. ▪ The ECO should monitor the removal of natural vegetation. If significant portions of natural vegetation are removed in very high sensitive areas, then an appropriate rehabilitation specialist should be consulted for further actions. ▪ The ECO should monitor and prevent any erosion and pollution (chemical spills etc.) within the WEF boundaries, particularly when associated with water features such as drainage lines, riparian vegetation and water bodies / wetlands.	▪ EMP efficiency monitoring during the construction phase. ▪ Training of ECO to be conducted shortly before construction commences. ▪ Natural vegetation removal monitoring during the construction phase. ▪ Erosion and pollution monitoring during the construction phase. ▪ Monitoring of potential off-road driving to occur during construction phase.	▪ Holder of the EA to appoint ECO. ▪ Avifaunal specialist to conduct training of ECO, if ECO is not educated and trained already. ▪ ECO. ▪ ECO. ▪ ECO.

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
			▪ Driving should, at all times, remain on existing or newly constructed roads. This should be strictly monitored so that habitat destruction does not occur.		
Disturbance & Displacement effects	Avoid disturbance of bird community due to the increase of people and vehicles in the area.	▪ Implement construction phase avifaunal monitoring. ▪ An ECO should be appointed to oversee that the EMP is being adhered to. ▪ ECO Training & Education of bird and energy related impacts. ▪ Minimise on-site disturbances.	▪ Appoint an avifaunal specialist to undertake a construction phase monitoring programme (minimum 1-year) to assess the disturbances occurring on site, as well as the success of the mitigation measures. To be conducted in accordance with the relevant Best Practice Guidelines. ▪ Monitor the efficiency of the EMP and revise, if necessary. Also monitor whether proposed measures are being adhered to or not. ▪ The ECO should be trained to identify priority bird species, as well as their breeding habits/locations. ▪ Reduce noise levels as far as possible.	▪ Appointment of specialist shortly before construction commences. ▪ Appointment of ECO shortly before construction commences. ▪ Training of ECO shortly before construction commences. ▪ Minimise disturbances throughout the construction phase.	▪ Holder of the EA to appoint avifaunal specialist. ▪ Holder of the EA to appoint avifaunal specialist. ▪ Avifaunal specialist to provide training to ECO, if not trained and educated already. ▪ Construction staff to adhere. ECO to oversee.
Fatalities due to collision	Prevent mortality of sensitive bird species due to collision with wind turbines and associated infrastructures.	▪ Fit bird flight diverters to overhead powerlines and weather mast guyed wires. The spacing of devices should be not more than 5-10 m apart.	▪ Attach bird flight diverters to overhead powerlines and weather mast guyed wires, to	▪ During the construction phase. ▪ During the construction phase.	▪ Holder of the EA to ensure this is installed. Construction staff to

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		▪ Powerlines should cross very high sensitive areas as little as possible, but should mainly aim to not be orientated perpendicularly to known bird flight paths. ▪ Lowest tip of turbines blades should not be lower than 40m. ▪ All overhead powerlines must be signed off as “bird-friendly” by an avifaunal specialist prior to construction.	increase the visibility of these structures to low flying birds. ▪ Powerlines should never run perpendicularly to known flight paths. They should only be orientated parallel to these flight paths – to avoid an increased risk of collision. ▪ To prevent collisions of small passerine species and low-flying birds, the lowest blade tip should not be lower than 40m. ▪ To ascertain that the overhead powerlines are relatively safe for the bird community, they should be signed off as being “bird-friendly” by the avifaunal specialist, prior to construction.	▪ During the construction phase.	implement. ECO to oversee. ▪ Holder of the EA to organise. Construction staff to implement. ECO to oversee. ▪ Holder of the EA to organise. Construction staff to implement. ECO to oversee.

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
C. OPERATIONAL PHASE					
C.1 AVIFAUNA IMPACTS					
Fatalities due to collision	Prevent mortality of sensitive bird species due to collision with wind turbines and associated infrastructures.	▪ Implement an operational phase avifaunal monitoring programme, in full compliance with the relevant Best Practice Guidelines, considering the following aspects: o During the first two years of the projects' operational phase: ▪ Monitoring campaign mirroring as a minimum, that conducted by Bioinsight during the pre-construction phase. ▪ Carcass searches, searcher efficiency trials and scavenger removal trials. o In the fifth year of the operational phase, and every five years thereafter (for the entire lifespan of the project): ▪ Carcass searches, searcher efficiency trials and scavenger removal trials. ▪ Necessity for a monitoring campaign (or parts thereof) to be reviewed after completion of the second operational monitoring year, and then again after the fifth year, and every five years thereafter.	▪ Implement an avifaunal monitoring programme in line with the most recent version of the Best Practice Guidelines that will be available at the time. ▪ Further operational mitigation measures to be researched during the operational monitoring campaign as an adaptive management approach. If significant levels of fatalities are observed in the opinion of the avifauna specialist, then these measures should be implemented. Such measures could include (but not limited to) shut-down on demand technology, habitat management, or bird deterrence systems. Regardless, according to IFC (2012) and BBOP (2012), if mitigation strategies are required, then <u>all</u> stakeholders	▪ During the first two years of the projects' operational phase. Then in the fifth year, and every five years thereafter. ▪ During the operational phase of the project.	▪ Avifaunal specialist. ▪ Avifaunal specialist for monitoring. Holder of the EA for implementation.

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		▪ Further operational mitigation measures to be researched during the operational monitoring campaign.	(including, but not limited to: Birdlife South Africa, DEA, developer, landowners [if relevant] etc.) are to be consulted accordingly, in order to make decisions on thresholds and the types of mitigation measures. Additionally, as soon as these issues are identified, the mitigation strategies should be written into the EMPr for the developer to comply with, irrespective of cost.		
Disturbance & Displacement effects	Avoid disturbance of bird community due to the increase of people and vehicles in the area.	▪ Minimise general on-site disturbances. ▪ No off-road driving. ▪ Implement speed limits (max 40km/h).	▪ Reduce noise levels as far as possible. ▪ Driving should, at all times, remain on existing roads. ▪ Speed limits should be implemented for driving, and should not exceed 40km/h.	▪ Minimise disturbances throughout the operational phase. ▪ No off-road driving throughout the operational phase. ▪ Speed limits to be implemented throughout the operational phase.	▪ All on-site personnel. ▪ All on-site personnel. ▪ All on-site personnel and monitored by the facility manager.

<table>
<tr><th rowspan="2">Impact</th><th rowspan="2">Mitigation/Management Objectives</th><th rowspan="2">Mitigation/Management Actions</th><th colspan="3">Monitoring</th></tr>
<tr><th>Methodology</th><th>Frequency</th><th>Responsibility</th></tr>
<tr><td colspan="6">D. DECOMMISSIONING PHASE</td></tr>
<tr><td colspan="6">D.1 AVIFAUNA IMPACTS</td></tr>
<tr><td>Disturbance & Displacement effects</td><td>Avoid disturbance of bird community due to the increase of people and vehicles in the area.</td><td>▪ Minimise on-site disturbances.
▪ Implement speed limits (max 40km/h).</td><td>▪ Minimise the presence of people and vehicles in very high sensitive areas, and reduce noise levels as far as possible.</td><td>▪ Minimise disturbances throughout the decommissioning phase.</td><td>▪ All on-site personnel.</td></tr>
</table>

1.9 CONCLUSION AND RECOMMENDATIONS

This report details the findings of the 12-month bird pre-construction monitoring programme conducted at the proposed Rondekop WEF site, and how such findings inform the requirements needed for the construction and implementation of the proposed development. The pre-construction bird monitoring programme methodology implemented covered all four seasons for the bird community on the site, as recommended by the *Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa* (Jenkins *et al*., 2015), therefore providing a solid baseline for the establishment of the future assessments.

Site visits confirmed the occurrence of a relatively high abundance of Accipitrid and Falcon species. The results have shown that both groups have a constant presence at the site throughout the year and spend a high proportion of their time and/or number of contacts at rotor height in comparison with the other groups of species. It is also important to note that their activity was largely associated with the hillside and escarpment areas, where most of the potential collision risk movements were observed. A total of eight (8) species confirmed on site may be of special concern for having an unfavourable conservation status in South Africa: Black Harrier *Circus maurus*, Ludwig's Bustard *Neotis ludwigii*, Martial Eagle *Polemaetus bellicosus* – Endangered; Black Stork *Ciconia nigra*, Verreauxs' Eagle *Aquila verreauxii* – Vulnerable; Karoo Korhaan *Eupodotis vigorsii*, Maccoa Duck *Oxyura maccoa*, Greater Flamingo *Phoenicopterus roseus* – Near Threatened (Taylor *et al*., 2015).

Sensitive areas identified at the proposed site considered the relevant aspects collected through the bird monitoring programme, including: relevant activity of sensitive species and associated potential for collision recorded in areas of hillsides and escarpments; particular association of passerine species and other relevant sensitive species to riverine thickets and water features; association of red-listed species with their potential breeding/roosting locations. This allowed for establishing avoidance areas (areas with very high sensitivity for birds).

Rondekop WEF **is considered to be located in an area of medium sensitivity with some habitat features of very high sensitivity in terms of the bird community** present. It is considered that the impacts can be minimised to the maximum extent possible, mostly through the **avoidance of very high sensitive areas, and through mitigation measures within areas of medium sensitivity**.

Presently, the potential impacts to birds is not anticipated to be of a high significance, provided that the aforementioned avoidance/mitigation measures are followed. As such, no fatal flaws were identified for this project, and the project may be authorised from an avifaunal perspective, subject to the proposed mitigation measures listed below being followed.

The following recommendations are proposed to reduce/mitigate the potential negative impacts that the Rondekop WEF may have on the local bird community:

Project Design Phase

- Ensure that the design of the WEF takes the sensitivity mapping of the avifauna specialist into account to avoid and/or reduce the impacts on Species and habitats of Conservation Concern. Currently, the present layout reveals that **one** proposed wind turbine (turbine #44) is located within or nearby (within 90m) identified no-go areas. This turbine should either be removed or relocated (with acceptability confirmation from the avifaunal specialist) before environmental authorisation can be given. It is important to note that no turbines should be allowed to be located within 90m of any no-go buffer, as this area is considered to be the 'impact zone' of wind turbines for the purposes of this study and the bird community on site.

- Plan to minimise the footprint of the construction to an acceptable level, as defined by the avifaunal specialist.

- Plan to use existing road networks, as far as possible.

- To prevent collisions of small passerine species and low-flying birds, turbines should be designed so that the lowest blade tip is not lower than 40m above ground.

Construction Phase

- Appoint an avifaunal specialist to conduct construction phase monitoring at the facility (and in a surrounding control area), for a minimum period of 1 year – to improve the understanding of the real impact caused by the WEF on local bird populations, as well as validate the success of mitigation strategies proposed.
- Appoint an ECO to oversee that the EMPr is being adhered to, and to be aware of bird sensitive species occurring in the area (including potential nests) – so that he/she can report any significant findings to the avifaunal specialist.
- Clearance and removal of natural vegetation should be kept to a minimum.
- Provide sufficient drainage along access roads to prevent erosion and pollution of adjacent watercourses or wetlands.
- No chemical spills or any other material dumps should be allowed within the WEF implementation area, with special focus on areas that are situated nearby riparian vegetation or drainage lines.
- No off-road driving is allowed, apart from when new roads are being constructed.
- Reduce noise levels as far as possible.
- Fit bird flight diverters to overhead powerlines and weather mast guyed wires to increase the visibility of these structures to low flying birds.
- Powerlines should try and avoid being sited in very highly sensitive areas, whenever possible. However, it will be more important that the orientation of the powerlines do not intercept any known bird flight paths / migratory routes at a perpendicular angle. Instead, to reduce the risk of collision, the orientation should rather be parallel to these flight paths. This should be further assessed for approval by the avifaunal specialist as soon as the powerline layout becomes available.
- All above-ground powerlines must be signed off as being “bird-friendly” by an avifaunal specialist, prior to construction.
- To prevent collisions of small passerine species and low-flying birds, the lowest blade tip should not be lower than 40m.

Operational Phase

Implement an operational phase avifaunal monitoring programme, in full compliance with the most recent/relevant Best Practice Guidelines that will be available at the time, to improve the understanding of the real impact caused by the WEF on local bird populations, as well as to validate the success of mitigation strategies proposed. This should include a programme that mirrors (as a minimum) the pre-construction monitoring programme, but should also include carcass searches, searcher efficiency trials and scavenger removal trials. This programme should run for the first two years of the projects’ operational phase. Thereafter, only the carcass searches, searcher efficiency trials and scavenger removal trials should be conducted during the projects’ fifth operational year, and every five years thereafter (for the entire duration of the projects’ life-span). The inclusion of a monitoring programme (similar to that of the pre-construction phase) can however be recommended by the relevant avifaunal specialist, should the requirement be identified at the end of the second operational monitoring year.

Further operational mitigation measures are to be researched during the operational monitoring campaign as an adaptive management approach. If significant levels of fatalities are observed in the opinion of the avifauna specialist, then these measures should be implemented. Such measures could include (but not limited to) the use of shut-down on demand technology, habitat management, or bird deterrence systems. All potential thresholds and mitigation strategies should always be consulted with all stakeholders including (but not limited to) Birdlife South Africa, Department of Environmental Affairs, the holder of the EA and Landowners [if necessary] etc. These stakeholders should come up with appropriate strategies that are to be written into the EMPr immediately and strictly followed by the holder of the EA, irrespective of the costs involved.

Reduce noise levels as far as possible.

Driving should, at all times, remain on existing roads.

A speed limit of 40km/h should always be adhered to within the facility.

Decommissioning Phase

Minimise the presence of people and vehicles (e.g. decommissioning staff) in very high sensitive areas, and reduce noise levels as far as possible.

Alternative/Updated Layouts

After analysing all the above alternatives, it was determined that the 'alternative 1' access road on the north ridge would be preferred due to its absence from a nearby drainage line, as well as its shorter distance of jeep track to be upgraded – as opposed to that of 'alternative 2'. For the centre ridge, 'alternative 1' access road is also preferred as this is shorter than 'alternative 2' and does not intercept identified sensitive areas like 'alternative 2' does. For the southern ridge, the same holds true as for the centre ridge. 'Alternative 1' is preferred due to its shorter length and lack of sensitive area overlap (as opposed to 'alternative 2'). However, it must be noted that for all three ridges, the 'alternative 2' options are acceptable for development – as long as appropriate mitigation measures are put in place, such as only building roads to cross sensitive areas perpendicularly.

In terms of construction camps, 'alternatives 5 & 6' are the least preferred as they intercept with identified sensitive areas. However, these alternatives can be considered favourable if the necessary mitigation measures are implemented. 'Alternatives 1-4' are considered as equally acceptable at this stage, as all of them are situated outside of sensitive areas, next to existing roads, and away from major drainage lines.

Lastly, for substations, 'alternative 6' is considered to be the most preferred option due to the absence of any major road being constructed, relative to the other alternatives. 'Alternatives 1 & 2' will require a longer road (relative to 'alternative 6') but are still considered short enough to be acceptable for development. For 'alternatives 3-5', there is currently no preference as all three will require roughly similar lengths of new roads to be constructed. However, at present, these alternatives are still considered acceptable for development (but less favourable than 'alternatives 1, 2 & 6'). It is however important to note that for substations, even though roads are important for informing sensitivity, the actual footprint of the substation itself should be considered, as well as the construction of any powerlines that are to be connected to the substation. One would need to consider whether or not the footprint of the substation is going to affect the bird community significantly or not. At this stage, it is not suspected that any of the proposed substation footprints will be a significant concern for the bird community on site. In terms of the overhead powerlines, one would need to consider the orientation of these lines away from the substation when distributing the electricity. This factor will be more relevant for bird collisions/electrocutions. However, it must be noted at this stage that the final layout of the powerline is still to be determined and will be subjected to its own

Basic Assessment study. Any potential avoidance/mitigation measures required will be recommended during that assessment.

To conclude, it must be noted that any conclusions that were drawn up were solely made based on the information available at the time of assessment. Should any new layout alterations be proposed (differing from that which was previously analysed) in the interim, then it will be necessary for these changes to be re-assessed by the specialist prior to submission.

All above conclusions are summarised below in table 11.

Table 11 - Comparative Assessment of Layout Alternatives

Alternative	Preference	Reasons (incl. potential issues)
ACCESS ROADS		
NORTH RIDGE		
Access Road Alternative North 1	Preferred	Shorter portion of present jeep track to be upgraded than alternative 2, without intercepting and upgrading roads near relatively larger drainage lines
Access Road Alternative North 2	Favourable	Longer portion of present jeep track to be upgraded than alternative 1, with a small portion of road to be upgraded next to a section of a relatively larger drainage line
CENTRE RIDGE		
Access Road Alternative Centre1	Preferred	Shorter and doesn't intercept sensitive areas
Access Road Alternative Centre 2	Least Preferred	Longer and does intercept sensitive areas
SOUTHERN RIDGE		
Access Road Alternative South 1	Preferred	Shorter and doesn't intercept sensitive areas
Access Road Alternative South 2	Least Preferred	Longer and does intercept sensitive areas
CONSTRUCTION CAMPS		
Construction Camp Alternative 1	No preference	Equally favourable to alternatives 2-4
Construction Camp Alternative 2	No preference	Equally favourable to alternatives 1, 3 & 4
Construction Camp Alternative 3	No preference	Equally favourable to alternatives 1, 2 & 4
Construction Camp Alternative 4	No preference	Equally favourable to alternatives 1-3
Construction Camp Alternative 5	Least Preferred	Encroaches into sensitive area
Construction Camp Alternative 6	Least Preferred	Encroaches into sensitive area
SUBSTATIONS		
Substation Alternative 1	Favourable	Requires relatively short distances of roads to be constructed (but not as short as alternative 6)
Substation Alternative 2	Favourable	Requires relatively short distances of roads to be constructed (but not as short as alternative 6)
Substation Alternative 3	No preference	Equally favourable to alternatives 4 & 5
Substation Alternative 4	No preference	Equally favourable to alternatives 3 & 5
Substation Alternative 5	No preference	Equally favourable to alternatives 3 & 4
Substation Alternative 6	Preferred	Requires the construction of the shortest length of road, relative to the other alternatives.

No-go Alternative

Should the Rondekop Wind Farm not be constructed, then all impacts (whether it be negative or positive) identified within the impact analysis will not take place. As a result, it is expected that the present environmental characteristics relevant for the bird community on site will remain unchanged, relative to that which is being observed at present, under current land-use practices.

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APPENDICES

Appendix I - Figures

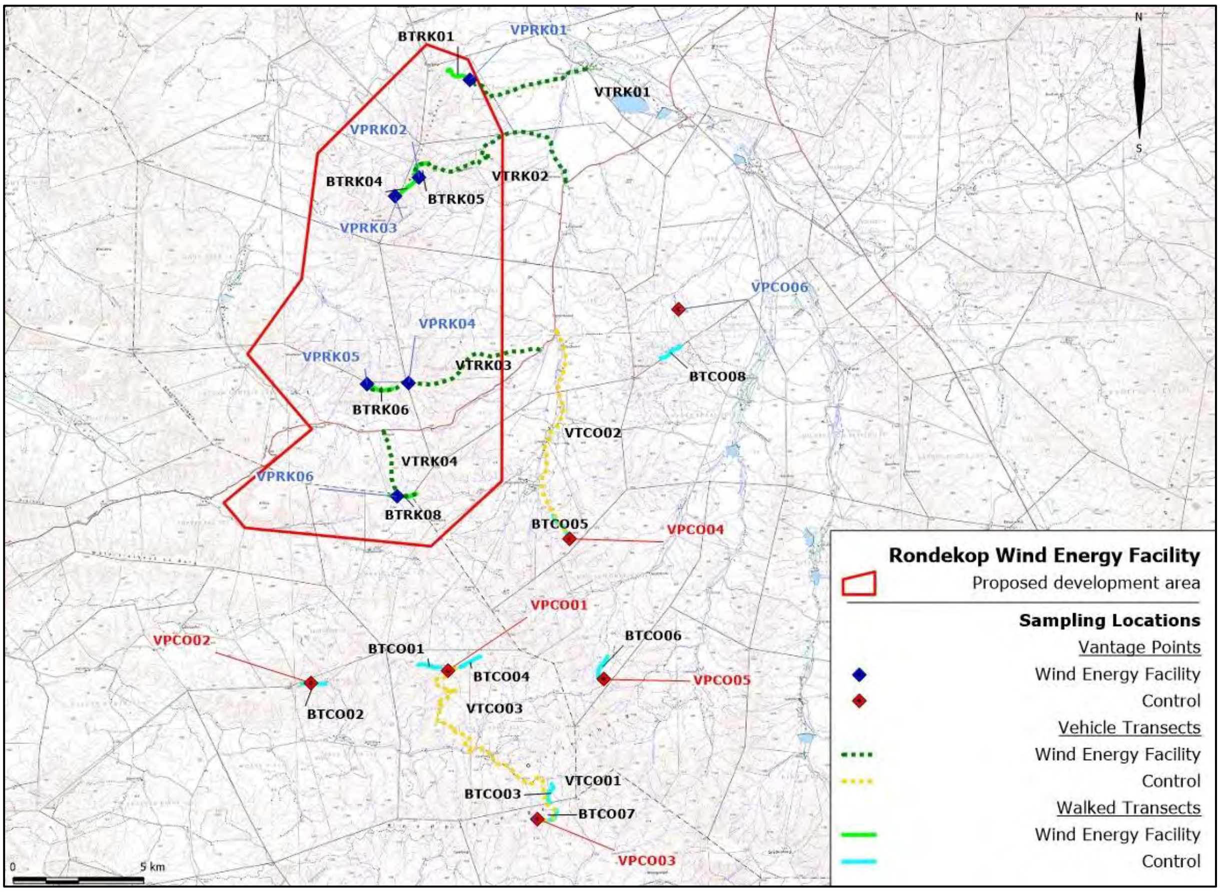

Figure 11 - Sampling locations at Rondekop WEF during the pre-construction bird monitoring programme.

Appendix II

PROJECT TITLE	MEGAWATT	STATUS
Brandvalley WEF	140 MW	Approved
Esizayo WEF	140 MW	Approved
Gunsfontein WEF	200 MW	Approved
Hidden Valley (Karusa & Soetwater) WEF	140 MW each	Preferred bidders status. Construction to commence in 2019
Hidden Valley (Greater Karoo) WEF	140 MW	Approved
Kareebosch WEF	140 MW	Approved
Komsberg West and East WEF	140 MW each	Approved
Kudusberg WEF	325 MW	In process
Maralla WEF (East and West)	140 MW each	Approved
Perdekraal East WEF	110 MW	Under construction
Perdekraal West WEF	150 MW	Approved
Rietkloof WEF	36 MW	Approved
Roggeveld WEF	140 MW	Preferred bidders status. Construction to commence in 2019
Sutherland WEF	140 MW	Approved
Sutherland SEF	10 MW	Approved
Tooverberg WEF	140 MW	In process
Witberg WEF	120 MW	Approved

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SOUTH AFRICA

Prepared for:

G7 Renewable Energies (Pty) Ltd

Rondekop Wind Energy Facility

Bird Pre-construction Monitoring

Pre-construction phase (2015/2016)

Final bird pre-construction monitoring report

February 2019

LOOKING DEEP INTO NATURE

www.bioinsight.co.za

EXECUTIVE SUMMARY

Rondekop Wind Energy Facility (WEF) is a proposed wind farm development planned to be situated south of Sutherland, in the Northern Cape Province. Bioinsight (Pty) Ltd was appointed to undertake and finalise the bird pre-construction monitoring programme in accordance with the best practice pre-construction monitoring guidelines (Jenkins *et al*., 2015).

The study area is characterised by accentuated mountainous areas with vegetation adapted to the semi-arid conditions and harsh rocky conditions. Currently, the area where Rondekop WEF is proposed shows no signs of intense disturbance (e.g. farm houses). The area is very difficult human access and therefore in almost pristine natural conditions apart from the severe impacts on the veld caused by the three year period of drought and grazing.

During the 12 months of pre-construction bird monitoring at the site, several methodologies were implemented to study the local bird communities, and inform the assessment of potential risks from the construction and operation of the proposed project. The following techniques were applied at the proposed WEF area and its immediate surroundings: a desktop and bibliographic review, walked and vehicle based transects, vantage point monitoring, incidental observations and waterbody and breeding evidence surveys.

Site visits confirmed the occurrence of a high abundance of *Accipitrids* and *Falcon* species. The results have shown that both groups have a constant presence at the site through the year and spend a high proportion of their time and/or number of contacts at rotor height in comparison with the other groups of species. It is also of note that their activity was especially associated with the hillside and escarpment areas, where most of the potential collision risk movements (flight at potential rotor height depending on the turbine specifications) were observed. A total of eight species confirmed on site may be of special concern for having an unfavourable conservation status in South Africa: Black Harrier *Circus maurus*, Ludwig's Bustard *Neotis ludwigii*, Martial Eagle *Polemaetus bellicosus* – Endangered; Black Stork *Ciconia nigra*, Verreauxs' Eagle *Aquila verreauxii* – Vulnerable; Karoo Korhaan *Eupodotis vigorsii*, Maccoa Duck *Oxyura maccoa*, Greater Flamingo *Phoenicopterus roseus* – Near Threatened (Taylor, Peacock & Wanless 2015).

Sensitive areas identified at the proposed site considered the relevant aspects collected through the bird monitoring programme, including: relevant activity of sensitive species and associated potential for collision recorded in areas of hillsides and escarpments; particular association of passerine species and other relevant sensitive species to riverine thickets and water features.

Rondekop WEF **is considered to be located in an area of medium sensitivity with some habitat features of high sensitivity in terms of the bird community** present. Impacts may be magnified due to cumulative impacts caused by other wind energy developments proposed in the area. Nonetheless, it is considered that although impacts cannot be totally eliminated, they can be minimised to the maximum extent possible, mostly through the **avoidance of no-go areas defined**. To the **medium sensitivity areas**, mitigation and compensation measures must be applied.

It is also recommended that a construction and operational phase bird monitoring programme be implemented in line with the best practice monitoring guideline to confirm and determine the extent of the impacts predicted as well as validate the success of mitigation strategy proposed and to inform adaptive mitigation management if required.

TECHNICAL TEAM

The technical team responsible for the pre-construction monitoring surveys and reporting is presented in following table.

Technician	Qualifications	Role on project
Ricardo Branca	MSc in Management and Conservation of Natural Resources BSc in Biology	Data analysis Report compilation
Craig Campbell	BSc in Conservation Ecology	Technician Field observer
Miguel Mascarenhas	Graduation in Applied Biology to Plant Resources MSc on Environmental Impact Assessment Postgraduate studies on Geographic Information Systems	Technical coordination Specialist & Author of Report
Nuno Salgueiro	Graduation in Applied Biology to Plant Resources Postgraduate on Environmental Sciences and Technologies	Technical coordination
Silvia Mesquita	Graduation in Applied Biology to Terrestrial animal resources Postgraduate Specialisation in Nature Tourism	Technical coordination
Helena Coelho	Graduation in Biology MSc in Marine and Coastal Sciences PhD in Biology	Technical coordination

Report compiled in February 2019.

CITATION

Recommended citation when using this report as a reference: Bioinsight (2019). *Rondekop Wind Energy Facility – Bird Pre-Construction Monitoring* 2015/2016.

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Specialist Declaration

Professional registration

The Natural Scientific Professions Act of 2003 aims to "Provide for the establishment of the South African Council of Natural Scientific Professions (SACNASP) and for the registration of professional, candidate and certified natural scientists; and to provide for matters connected therewith."

"Only a registered person may practice in a consulting capacity" – Natural Scientific Professions Act of 2003 (20(1)-page 14)

Specialist Investigator:	Miguel Mascarenhas (Pri.Sci.Nat)
Qualification:	MSc on Environmental Impact Assessment – Univ. of Málaga (Spain)
	Postgraduate on Business Management – INDEG Business School (Portugal)
	Postgraduate on Geographic Information Systems – Univ. of Lisboa (Portugal)
	BSc on Applied Biology to Plant Resources – Univ. of Lisboa (Portugal)
Affiliation:	South African Council for Natural Scientific Professions
Registration number:	400168/14
Fields of Expertise:	Ecological Science
Registration:	Professional Member

Declaration of Independence

Bioinsight (Pty) Ltd and the Specialist Investigator declares that:

- We act as independent specialists for this project.
- We consider ourselves bound by the rules and ethics of the South African Council for Natural Scientific Professions.
- We do not have any personal or financial interest in the project except for financial compensation for specialist investigations completed in a professional capacity as specified by the Environmental Impact Assessment Regulations, 2006.
- We will not be affected by the outcome of the environmental process; of which this report forms part of.
- We do not have any influence over the decisions made by the governing authorities.
- We do not object to or endorse the proposed developments, but aim to present facts and our best scientific and professional opinion with regard to the impacts of the development.
- We undertake to disclose to the relevant authorities any information that has or may have the potential to influence its decision or the objectivity of any report, plan, or document required in terms of the Environmental Impact Assessment Regulations, 2006.

- Should we consider ourselves to be in conflict with any of the above declarations, we shall formally submit a Notice of Withdrawal to all relevant parties and formally register as an Interested and Affected Party.

Professional experience

Miguel Mascarenhas has been involved in environmental impact assessment and ecological monitoring for more than 10 years. He has experience with bat interactions with renewable projects, namely energy infrastructure for more than 6 years. During this period, he has been involved in impact assessments and ecological monitoring for over 100 projects, at least 50 of which involved onshore wind energy generation in South Africa. A full Curriculum Vitae can be supplied on request.

Terms and Liabilities

- This report is based on a full pre-construction monitoring year investigation using the available information and data related to the site to be affected.
- The Precautionary Principle has been applied throughout this investigation.
- Additional information may become known or available during a later stage of the process for which no allowance could have been made at the time of this report.
- The Specialist Investigator reserves the right to amend this report, recommendations and conclusions at any stage should additional information become available.
- Information, recommendations and conclusions in this report cannot be applied to any other area without proper investigation.
- This report, in its entirety or any portion thereof, may not be altered in any manner or form or for any purpose without the specific and written consent of the specialist investigator as specified above.
- Acceptance of this report, in any physical or digital form, serves to confirm acknowledgment of these terms and liabilities.

Signed on the 11th of December 2018 by Miguel Rodolfo Teixeira de Mascarenhas in his capacity as specialist investigator.

Miguel Rodolfo Teixeira de Mascarenhas

PREFACE: BIRDS AND WIND TURBINES

Wind power has grown exponentially in the last decade and it is one of the main alternative energy sources to fossil fuels (Gsänger & Pitteloud 2013). Its development in South Africa is relatively new – having installed only 10MW by the end of 2012 (Gsänger & Pitteloud 2013).

This energy source is however not free from environmental impacts. The installation of wind energy facilities around the world has revealed some issues regarding wildlife conservation, specially related to bird and bat communities. Since 1992, when the first episodes of avian fatalities related to wind turbines were published (Orloff & Flannery 1992), social concern has arisen, and many articles and reports have been issued to date. Several recent reviews on this topic are available and this introductory chapter provides a summary of these (Drewitt & Langston 2006; Arnett *et al.* 2007; NRC 2007; Strickland *et al.* 2011) in an attempt to outline the possible impacts of wind energy facilities on bird communities. Until today the potential for significant impacts remains a concern as many wildlife populations overlapping with wind energy development experience declines potentially caused by habitat loss, disease, non-native invasive species and increased mortality (AWWI 2015).

Mortality caused by collision with wind turbines

Direct mortality can be caused by collision with the rotating blades of the wind turbines. Although most of the attention has been directed to *Raptors* and other large-sized birds, most of the fatalities recorded at wind farms are of passerines and other small species (<31cm length) (AWWI 2015). The reason for considering *Raptors* and large birds to be more sensitive to this impact is because of their relatively low numbers (i.e. proportion of fatalities and abundance), important role in ecosystems, and their low densities and reproduction rates. Therefore, the loss of a few individuals can have significant implications at the local and regional level, and the combined effects of several projects can be detrimental at a broader scale. This is especially true for endangered, rare or scarce species.

Bearing this in mind, <u>it is important to note that the majority of the wind energy facilities operating internationally report low levels of bird fatalities from collision with wind turbine blades</u>, ranging from three to five birds per MW per year (adjusted for detection biases) (AWWI 2015). Additionally, the results from the first round of wind farms in the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) in South Africa indicate that the levels of bird fatalities from collision with turbine blades, range from approximately one to six birds per MW per year (Ralston-Paton et al., 2017), being in line with the findings that have been reported internationally. In fact, for passerines it is considered a relatively minor source of mortality compared to other human structures or activities such as transport infrastructures (e.g. roads and highways), buildings, mining activities, windows and communication towers (Calvert *et al.* 2013; Loss, Will & Marra 2013; AWWI 2015). However, the cumulative effects and the development of new installations in places where there was no previous human presence are important factors to take into consideration.

Although most of the international projects do not result in high fatality rates, some of them have reported important episodes (e.g. Altamont Pass, California (Orloff & Flannery 1992; Smallwood & Thelander 2004); Tarifa, Spain (Barrios 1995; Barrios & Rodríguez 2004); Navarra, Spain (Lekuona & Ursúa 2007) and some uncertainty about the real numbers of wind turbine bird fatalities remains (e.g. due to lack of standardisation of the studies).

It is considered that collision probability is related to particular characteristics of the species present in the area (e.g. large species with low flight manoeuvrability and/or with particular flight behaviours are more prone to collisions), to the presence of certain environmental features (e.g. ridges, forests or wetlands that could attract different species), and to the characteristics of the infrastructure (e.g. lighting, shape and material of the wind turbines and rotor size) and wind turbine layout (De Lucas *et al.* 2008; Ferrer *et al.* 2012).

Habitat related impacts

Direct habitat loss due to the installation of turbines is generally not considered a critical issue, as the amount of habitat directly transformed by the development of wind energy facilities is not usually high. Nevertheless, the construction of roads and other infrastructure associated with wind developments in sensitive habitats could lead to displacement of species with narrow ecological niches.

Some species may suffer from displacement due to disturbance produced by human activity in the area. This is highly dependent on different species and on the characteristics and availability of the habitats at each location. Habituation to these changes cannot be assumed as some studies undertaken internationally concluded that bird abundance declines with time after the impact occurs, at least if the impact persists (Hotker, Thomsen & Jeromin 2006; De Lucas, Janss & Ferrer 2008).

Wind energy facilities located directly within migration or local commuting routes can produce barrier effects, causing avoidance of the area and therefore the utilisation of alternative routes. If this alternative route consumes more energy, linkages between areas of biological importance for birds, such as feeding, roosting or nesting can be affected, and result in significant reductions in use of the area and/or species fitness (Winkelman 1992; Christensen *et al.* 2004).

Cumulative effects

Cumulative impacts of a development project may be defined as "impacts resulting from incremental actions from the project, by addition with other past, present or future impacts resulting from other actions/project reasonable predictable" (Walker & Johnston 1999) and more recently as "additional changes caused by a proposed development in conjunction with other similar developments or as the combined effect of a set of developments, taken together" (SNH 2012). This assumes the knowledge of other projects or actions whose effects could be added to the ones resulting from the project being assessed. The effect of cumulative impacts will be assessed and documented in the avifauna environmental impact assessment report, which terms of reference will be determined by the appointed environmental assessment practitioner. However, it is proposed that the analysis should focus on the methodologies presented by Masden *et al.* 2010 and SNH 2012:

- The projects known for the area and its surroundings and for which there's information readily available;
- The projects that could be relevant in terms of the expected impacts, in relation to the project under assessment;
- The impact sensitive species more relevant and/or susceptible to the expected impacts.

Even where fatality rates may appear low, adequate attention should be given to it. The cumulative effects of several facilities on the same species could be considerable, particularly if these are located in the same region and impact on the same population of the species. Also most of the long lived and slow reproducing Red List species may not be able to sustain any additional mortality factors over and above existing factors.

The cumulative effects of large wind farm installations may be considerable if bird movements are consequently displaced. This may lead to the disruption of ecological links between feeding, breeding and roosting areas.

The need to evaluate these effects, outlined above, is more relevant in South Africa since the South African experience of wind energy generation has been extremely limited to date and wind energy developments are currently under expansion. Until the end of 2013, only eight wind turbines had been constructed and operated in South Africa, namely, three at a demonstration facility at Klipheuwel in the Western Cape, four at a site near Darling, and one at Coega near Port Elizabeth. During that time period only one peer-reviewed 12-month study assessing birds and bird fatalities has been completed in South Africa and the results published, reporting bat and bird fatalities produced by wind energy facilities (Doty & Martin 2013). This study was undertaken at a pilot turbine installed in the Coega Industrial Development Zone, Port Elizabeth, Eastern Cape. Only one bird fatality was reported, i.e. a Little Swift *Apus affinis*. In this study no information regarding habitat related issues were determined. In 2014 several other wind turbines started operating, and fatality results obtained from these wind farms indicated an average of 4.11 bird fatalities per turbine per year (adjusted for bias trials) (Raston-Paton et al., 2017), being in line with results obtained internationally (AWWI 2015). Recent fatality reports indicated direct impacts in species of conservation concern: three Verreauxs' Eagle *Aquila verreauxii* fatalities in the same wind energy facility, in the Eastern Cape. Evidence of what caused those impacts is still limited (Smallie 2015). Also a recent short note has given notice of three Blue Crane *Anthropoides paradiseus* fatalities caused by collision with wind turbines (Smallie 2016). The potential impacts of wind turbines on South African bird communities are still largely unknown. Therefore, data collection and further investigation are needed and pre- and post-construction monitoring should be implemented to fill these gaps and promote the sustainability of wind energy developments in South Africa.

The Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in Southern Africa (Jenkins *et al.* 2015) were developed by BirdLife South Africa and the Endangered Wildlife Trust (EWT). Furthermore, species-specific guidelines were also developed in order to minimise the risks of wind energy facilities to certain sensitive bird species in South Africa, namely for the Verreaux's Eagle and Cape Vulture. and the only relevant guideline for this particular site is the guidelines for impact assessment, monitoring and mitigation for Verreaux's Eagle and Wind Farms (Birdlife South Africa, 2017). Both of the aforementioned guidelines provide technical guidance for consultants to carry out impact assessments and monitoring programmes for proposed wind energy facilities, in order to ensure that pre-construction monitoring surveys produce the required level of detail for authorities reviewing environmental authorisation applications. The minimum standards of best practice specific considerations relating to the pre-construction monitoring of proposed wind energy facility sites in relation to birds are outlined in this document.

In conclusion, the selection of the correct location of these facilities at various levels, from the location of the project to the micro sitting of the turbines, and the application of the correct mitigation measures are considered critical issues in reducing the impacts and reconciling development of the wind energy industry and biodiversity conservation.

INDEX

1. Introduction

This report details the findings of the bird pre-construction monitoring surveys conducted at the proposed Rondekop Wind Energy Facility (hereafter referred to as Rondekop WEF), between January 2016 and October 2016.

In order to assess the potential impact of the project, a complete monitoring programme was developed including one year of surveys prior to the wind farm construction to establish a baseline scenario for the future project phases (construction and operation).

1.1. Scope of work and Objectives

The main objective of the pre-construction bird monitoring programme was to characterise the bird community present in the area and provide baseline information to assess bird habitat use in a pre-impact scenario, and inform evaluation of the potential impact produced by the Rondekop WEF (such as bird collision mortality, displacement due to disturbance, barrier effects and habitat loss (Drewitt & Langston 2006)). The specific objectives outlined for this pre-construction bird monitoring programme are:

a) Establish the pre-impact baseline reference and characterisation of the bird communities occurring within the development area;

b) Identify the bird species or groups more susceptible to potential impacts (displacement and/or collision) during the construction and operation phase of the wind energy facility;

c) Identify the project elements more likely to produce impacts on the avifauna and/or habitats during and after construction;

d) Evaluate potential changes in the way sensitive species, and the general bird community, will use the wind energy facility site during the construction and operation phases;

e) Assess and map the collision risk for sensitive species. Outline sensitive areas and/or No-Go areas if necessary;

f) Propose measures to avoid or, if unavoidable, mitigate, compensate and monitor, identified potential impacts.

In order to achieve the objectives of the pre-construction bird monitoring programme an experimental protocol was established, covering the relevant areas for avifauna within the Wind Energy Facility site (WEF), its immediate surroundings and a Control (CO) area (figure 1). This pre-construction bird monitoring programme was based on extensive experience in bird and wind farm monitoring and was designed in order to comply with the key requirements of the "*Best- Practice Guidelines for assessing and monitoring the impact of wind-energy facilities on birds in southern Africa*" (Jenkins *et al.* 2015) and the recommendations of the Avifaunal Specialist Impact Scoping Study (Bioinsight 2016a). This programme entails the implementation of standardised study methods before, during and after construction, in the area of the WEF, its immediate surroundings and a CO area (BACI, Before-After Control-Impact analysis) as proposed by national and international references (such as SNH 2009; Atienza *et al.* 2011; Strickland *et al.* 2011; Jenkins *et al.* 2012; USFWS 2012).

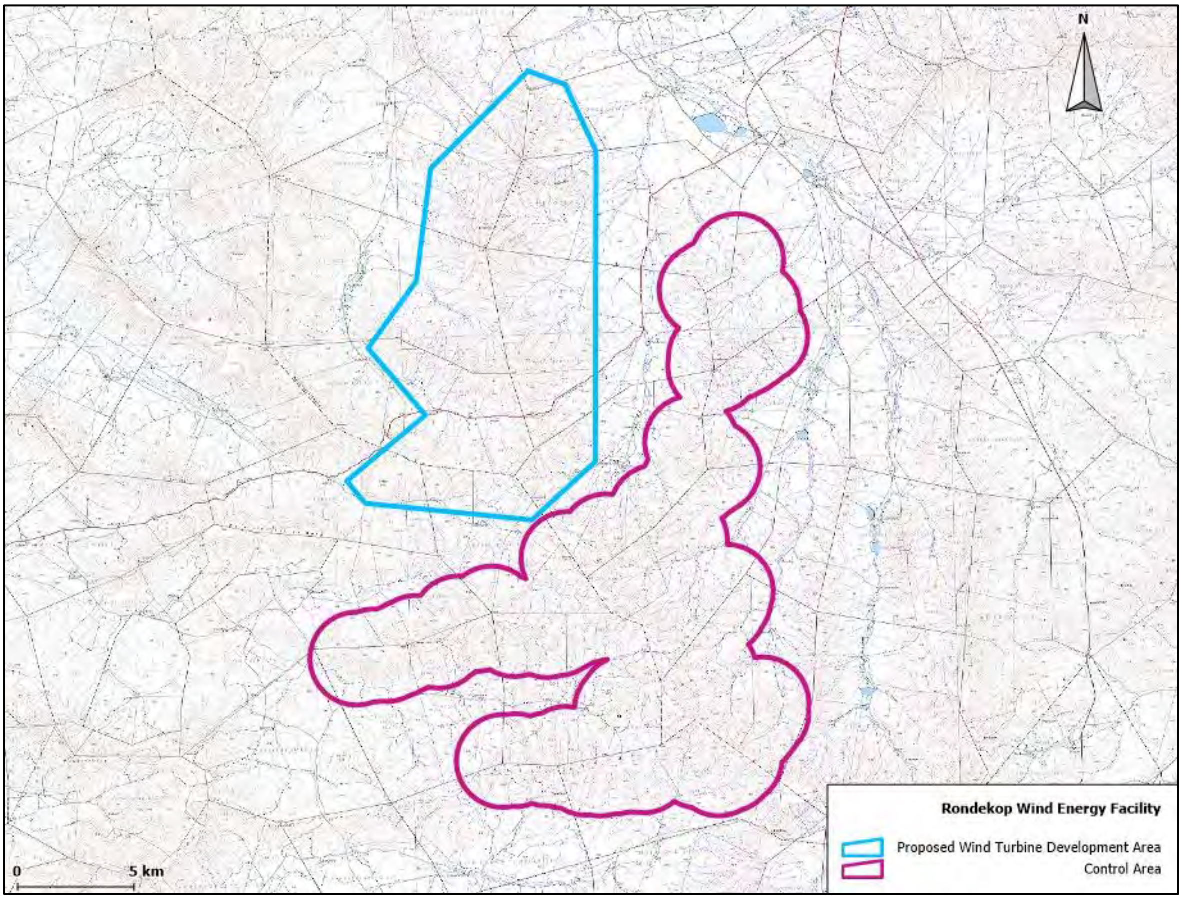

Figure 1 - Locations of the proposed core wind energy development area and control site, relevant for the avifauna on site.

Although the general bird community was surveyed, the experimental protocol was specially directed to a set of **25 species considered sensitive** to wind energy development impacts (hereafter simply referred to as sensitive species), 11 of which are *Accipitrids, Falcons and similar*, 8 are *Large Terrestrial Birds* and 6 are *Passerine and other small terrestrial birds* (Table 1). These species were selected considering those identified in the Avifaunal Impact Assessment Scoping Report as target species (Bioinsight 2016a); species considered as priority for inclusion in studies considering wind farms (Retief *et al.* 2012) and lastly species considered prone to impacts caused by wind energy facilities (see section 2.1.1 for the definition of the types of surrogate species).

The pre-construction bird monitoring programme includes the following components:

- Vantage point – to allow for the detection of large bird species present in the study area, the estimation of their abundance, seasonality and the characterisation of their flights, and to gain a general idea of their use of the habitats. This data is important in achieving Objectives a) to e).
- Walked linear transects – designed to survey passerines and other small to medium sized birds. Using this technique, densities and composition of these groups of birds are estimated for the different habitats, seasons and sampling sites. This data is important in achieving Objectives a) to e).
- Vehicle based transects – implemented in order to detect other large bird species less prone to flight (such as *Bustards*), and allows covering greater areas in the wind energy facility surroundings. This

technique was used to complement nest and roost surveys and for defining the distribution of sensitive species. This data is important in achieving Objectives a) to e).

- Waterbodies monitoring – used for characterizing the use of these features by *Waterbirds*, and contribute to Objectives a) to e).
- Inventory, search, inspection and monitoring of breeding evidence – during pre-construction and operation phases. This data is important in achieving Objectives a) to e).

The implementation of the continuation of a similar monitoring programme during the construction and operational phases of the development is necessary, while the operational phase should also include the implementation of bird carcass searches around the turbines and determination of the searcher efficiency and carcass persistency (by scavengers or decomposition) which will provide data to quantify bird fatalities associated with the wind energy facility and determine the species affected as per the recommendations of the best practice guideline (stage 3 and 4 monitoring).

By referring to the baseline scenario established (on the scope of the present report) and implementing a BACI analysis it will be possible to validate the potential impacts identified, to determine if other impacts are occurring and adequately adjust any mitigation measures proposed at this stage (or propose new and more appropriate ones if necessary).

All the above methodologies will enable the accomplishment of Objective f).

Table 1 - Sensitive bird species considered central to the avian impact assessment process for the Rondekop WEF. **Global RLCS (WW) (Red List Conservation Status)** (IUCN 2016) **and South Africa RLCS (SA)** (Taylor, Peacock & Wanless 2015)**: EN – Endangered; VU – Vulnerable; NT – Near threatened; LC – Least Concern; NA – Not Assessed; Endemism in South Africa** (BLSA 2016)**: * – endemic; (*) – near-endemic; SLS – endemic to South Africa, Lesotho and Swaziland. Likely Impacts: C – Collision; D – Disturbance and/or Displacement; H – Habitat destruction.**

Group	Common Name	Scientific Name	RLCS SA	RLCS WW	Convention Migratory Species (Appendix)	Endemic to South Africa	Population Trend	Priority species	Likely Impacts
"Ciconids"	Hamerkop	*Scopus umbretta*	-	LC	-	-	Stable	X	D
"Ciconids"	Black Stork	*Ciconia nigra*	VU	LC	II	-	Unknown	X	C, D
"Ciconids"	African Sacred Ibis	*Threskiornis aethiopicus*	-	LC	II (subsp. aethiopicus)	-	Decreasing	X	D
"Waterbirds"	Greater Flamingo	*Phoenicopterus roseus*	NT	LC	II	-	Increasing	X	C; D
"Waterbirds"	Cape Shoveler	*Anas smithii*	-	LC	II	-	Increasing	-	D
"Waterbirds"	Maccoa Duck	*Oxyura maccoa*	NT	NT	II	-	Decreasing	-	D
"Nocturnal Raptors"	Spotted Eagle-Owl	*Bubo africanus*	-	LC	-	-	Stable	X	D, H
"Accipitrids"	Verreauxs' Eagle	*Aquila verreauxii*	VU	LC	II	-	Stable	X	C, D, H
"Accipitrids"	Booted Eagle	*Hieraaetus pennatus*	-	LC	II	-	Decreasing	X	C, D, H
"Accipitrids"	Martial Eagle	*Polemaetus bellicosus*	EN	VU	II	-	Decreasing	X	C; D; H
"Accipitrids"	Black-chested Snake Eagle	*Circaetus pectoralis*	-	LC	II	-	Unknown	X	C; D; H
"Accipitrids"	Jackal Buzzard	*Buteo rufofuscus*	-	LC	II	(*)	Stable	X	C, D, H
"Accipitrids"	Pale Chanting Goshawk	*Melierax canorus*	-	LC	II	-	Stable	X	C, D, H
"Accipitrids"	Black Harrier	*Circus maurus*	EN	VU	II	(*)	Stable	X	C, D, H
"Accipitrids"	African Harrier-Hawk	*Polyboroides typus*	-	LC	II	-	Stable	X	C, D, H

Group	Common Name	Scientific Name	RLCS SA	RLCS WW	Convention Migratory Species (Appendix)	Endemic to South Africa	Population Trend	Priority species	Likely Impacts
"Falcons"	Rock Kestrel	*Falco rupicolus*	-	NA	II	-	NA	-	C, D, H
"Falcons"	Greater Kestrel	*Falco rupicoloides*	-	LC	II	-	Stable	X	C, D, H
"Bustards"	Ludwig's Bustard	*Neotis ludwigii*	EN	EN	-	-	Decreasing	X	D, H
"Bustards"	Karoo Korhaan	*Eupodotis vigorsii*	NT	LC	-	-	Increasing	X	D, H
"Phasianids"	Grey-winged Francolin	*Scleroptila africana*	-	LC	-	SLS	Stable	X	D, H
"Phasianids"	African Snipe	*Gallinago nigripennis*	-	LC	II	-	Unknown	-	D
"Passerines"	Common Swift	*Apus apus*	-	LC	-	-	Decreasing	-	C; H
"Passerines"	Cape Clapper Lark	*Mirafra apiata*	-	LC	-	(*)	Decreasing	-	C, D, H
"Passerines"	Karoo Lark	*Calendulauda albescens*	-	LC	-	(*)	Decreasing	-	C; D; H
"Passerines"	Large-billed Lark	*Galerida magnirostris*	-	LC	-	(*)	Increasing	-	C, D, H

1.2. Terms of reference

The final avifauna monitoring assessment was conducted according to the specialist terms of reference, and is also mentioned in the impact assessment report. The following terms of reference applies and should be read along with the impact assessment report:

- Conduct a review of national and international specialised literature and experiences regarding birds and wind farms;
- Conduct a field investigation to determine the bird community present in the study area. Although the general bird community is considered, this study will have special focus on the species considered to be more sensitive to wind energy development related impacts;
- Describe the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed project;
- Describe and evaluate the environmental issues and potential impacts (including direct, indirect, cumulative impacts and residual risks) identified of the proposed project and identified alternatives in terms of the nature, the causes of the effect, what will be affected and how it will be affected;
- Compare feasible alternatives, and nominate a preferred layout alternative;
- Identify any aspects which are conditional to the findings of the assessment which are to be included as conditions of the Environmental Authorisation;
- Identify and map sensitive and "no-go" areas within and around the proposed Wind Energy Facility site;
- Identify any gaps in knowledge as well as any areas that would constitute "acceptable and defendable loss";
- Provide a statement regarding the potential significance of the identified issues based on the evaluation of the issues/impacts and a reasoned opinion as to whether the proposed project should be authorised;

- Provide recommendations regarding any mitigation measures and management to be included in the Environmental Management Programme to be submitted with the Final Environmental Impact Assessment Report;
- Propose a suitable monitoring programme for the evaluation of the impacts expected during the operational phase of the development, if considered necessary.

1.3. Legal framework

It is considered best practise for bird monitoring to be undertaken on wind energy facility sites, in order to fulfil the requirements outlined by the "Best- Practice Guidelines for assessing and monitoring the impact of wind-energy facilities on birds in southern Africa" (Jenkins *et al.* 2015).

There are no permit requirements dealing specifically with birds in South Africa. However, legislation which applies to birds includes the following:

National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004):

Sections 2, 56 and 97 are of specific reference. Section 97 considers the Threatened or Protected Species Regulations: The Act calls for the management and conservation of all biological diversity within South Africa.

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected.

NEMBA also deals with endangered, threatened and otherwise controlled species, under the ToPS Regulations (Threatened or Protected Species Regulations). The Act provides for listing of species as threatened or protected, under one of the following categories:

- Critically Endangered: any indigenous species facing an extremely high risk of extinction in the wild in the immediate future.
- Endangered: any indigenous species facing a high risk of extinction in the wild in the near future, although it is not a critically endangered species.
- Vulnerable: any indigenous species facing an extremely high risk of extinction in the wild in the medium-term future; although it is not a critically endangered species or an endangered species.
- Protected species: any species which is of such high conservation value or national importance that it requires national protection. Species listed in this category include, among others, species listed in terms of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

A ToPS permit is required for any activities involving the removal or destruction of any ToPS-listed species.

Northern Cape Nature Conservation Act, 2009 (Act No 9 of 2009)

At a Provincial level, birds are protected by Northern Cape Department of Environment and Nature Conservation (DENC) under the National Environmental Management: Biodiversity Act (see above). In addition, provincially protected and specially protected species are listed in the Northern Cape Nature Conservation Act, 2009 (Act No 9 of 2009).

IUCN Red List of Threatened Species

The International Union for the Conservation of Nature (IUCN) Red List of Threatened Species ranks plants and animals according to threat levels and risk of extinction, thus providing an indication of biodiversity loss. This has become a key tool used by scientists and conservationists to determine which species are most urgently in need of conservation attention. In South Africa, a number of birds are listed on the IUCN Red List.

Convention on Biological Diversity

This Convention aims to protect and maintain biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits from the use of genetic resources. The Convention intends to enforce the concept of sustainable use of resources among decision-makers and that these are not infinite. It also offers decision-makers guidance based on the precautionary principle. South Africa is a Party of this convention since 1993.

Convention on the Conservation of Migratory Species of Wild Animals (CMS)

CMS is a treaty of the United Nations Environment Programme (UNEP), which provides a global platform for the conservation and sustainable use of migratory animals and their habitats. South Africa is a Party State since 1991. CMS includes the States through which migratory animals pass (Range States), and establishes the legal foundation for internationally coordinated conservation measures throughout a migratory range. Besides establishing obligations for each State joining the Convention, CMS promotes concerted action among the Range States of many of these species.

The CMS has two Appendices: Appendix I pertains to migratory species threatened with extinction and Appendix II that regards migratory species that need or would significantly benefit from international co-operation. CMS Parties strive towards strictly protecting these animals, conserving or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them.

African-Eurasian Waterbird Agreement (AEWA)

The Agreement on the Conservation of African-Eurasian Migratory Waterbirds was established under the CMS and administered by the UNEP. It is an intergovernmental treaty focused on the conservation of migratory waterbirds and their habitats across their occurrence range. South Africa is a contracting party since 2002. The Agreement requires that the habitat of the species covered by the AEWA are in good quality for breeding, and therefore it is essential for the signatory countries to have concerted efforts in the conservation and management of these migratory populations.

1.4. Proposed wind energy facility and study area

Rondekop WEF is being proposed by Rondekop Wind Farm (Pty) Ltd for the installation of wind turbine generators. The project is located approximately 45km southwest of Sutherland in the Northern Cape Province (Figure 2). The WEF includes the proposed implementation of up to 48 wind turbines, with 6 proposed access roads (two on each of the three ridges), 6 construction camps and substation locations. All of these infrastructures are assessed in the Bird Impact Assessment Report. Powerline infrastructures will be assessed in a separate Basic Assessment Process.. The development is expected to be able to produce up to 325 MW, with individual turbine capacities being up to 8MW.

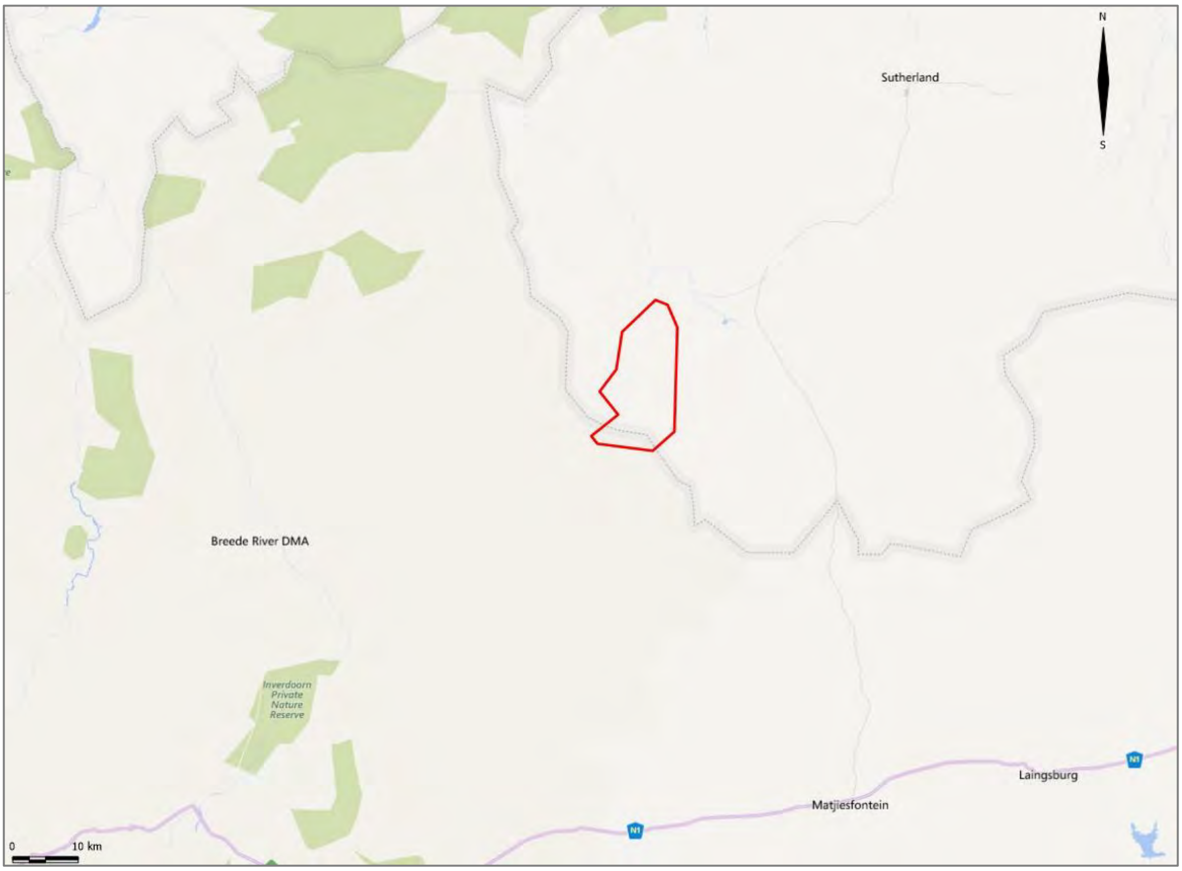

Figure 2 – Location of the proposed Rondekop Wind Energy Facility (source: Virtual Earth Street Image).

Figure 2 indicates the core project area where turbines are proposed. Associated infrastructure may extend beyond this rough boundary.

Vegetation types

The site falls within the Succulent Karoo and the Fynbos biome, with the occurrence of two main vegetation types (Mucina & Rutherford 2006) (Figure 3):

- **Central Mountain Shale Renosterveld** (Fynbos biome): associated with areas of slopes and broad ridges where the vegetation is predominantly tall shrubland and renosterveld composed by non-succulent karoo shrubs and a rich flora in rockier areas.
- **Koedoesberge-Moordenaars Karoo** (Succulent Karoo biome): this type of vegetation is found in slightly undulating to hilly landscape and is characterised by low succulent scrub with interspersed taller shrubs. Rain may occur through the year though it is more likely during winter season – two rainfall peaks during the year: one in March and the other in May – August.

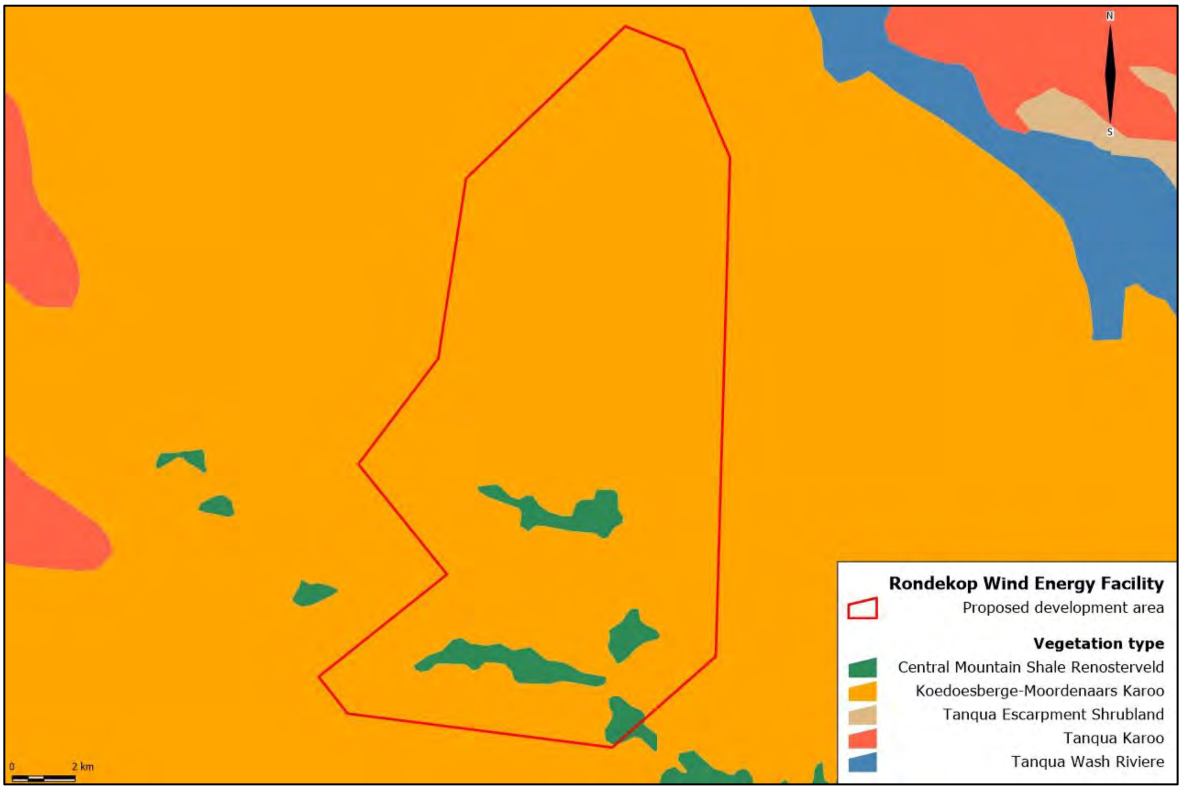

Figure 3 – Vegetation units present within the Rondekop WEF and surrounding area according to Mucina & Rutherford (2006) updated to version 2012.

As mentioned the site is characterised by accentuated mountainous areas with very difficult human access and therefore in almost pristine natural conditions. Vegetation is adapted to the semi-arid conditions and harsh rocky conditions. Currently the area where Rondekop WEF is proposed shows no signs of intense disturbance (Photograph 3) other than apart from the severe natural impacts on the veld caused by the three year period of drought and grazing. Signs of human disturbance are characterised by the presence of a few farm houses.

Bird micro-habitats

The proposed Rondekop WEF site and surrounding area is characterised by accentuated mountainous areas which is located between two vegetation types and major biotopes: the Fynbos biome and the Succulent Karoo biome. Both are characteristic of higher altitudes and are present both in the bottom and top of the mountains. The area is mostly comprised of natural vegetation. Nonetheless there are several species which are dependent on this type of habitat such as per example: Verreauxs' Eagle *Aquila verreauxii*, Grey-backed Cisticola *Cisticola subruficapilla*, Karoo Prinia *Prinia maculosa* and Grey-winged Francolin *Scleroptila Africana*.

Apart from the bird species that are naturally associated with the Fynbos and the Succulent Karoo biome, other species with more widespread distribution areas and less specific habitat requirements may also occur. These species are likely to be attracted by factors such as land-use, topography and the presence of drainage lines and wetlands in the surroundings of the site. Within the proposed Rondekop WEF site the area is mostly reserved as natural vegetation. Potential avifaunal micro habitats identified at the site are described below.

Water bodies

During the field work and through analysis of the aerial imagery it was found that the site is lacking in water features of large dimensions and with well-developed surrounding vegetation, adequate to accommodate large bird species such as Cormorants, Grebes, Herons or Ibises. Nonetheless a small pond was found in the surroundings of the study area (Photograph 1). A site with these characteristics may be an attraction feature for bird species such as the Red-knobbed coot *Fulica cristata*, Three-banded Plover *Charadrius tricollaris*, among others.

Photograph 1 – Water body found in the surrounding area of the Rondekop WEF site with water.

Rocky outcrops

Within the site, several rocky outcrops were found, as well as rock crevices in the mountain side, with the latter which provide optimal conditions for cliff-nesting species (Photograph 2). It is very likely that species such as the Verreauxs' Eagle, Rock Kestrel, and others, may use the crevices between rocks to nest.

Photograph 2 – Boulder accumulations found within Rondekop WEF proposed farm portions.

Natural vegetation

The proposed development area is occupied mainly by natural vegetation. Though composed by two vegetation units it has a homogenous and similar structure from the top of mountains to the bottom valleys, revealed by the constant presence of small scrubby vegetation (Photograph 3). Although the raptors listed as sensitive species do not necessarily roost or nest at the WEF site, they will forage in natural veld. Therefore, several sensitive species have potential to be present in the study area due to this type of vegetation including Booted Eagle *Hieraaetus pennatus*, Jackal Buzzard *Buteo rufofuscus* Black Harrier *Circus maurus*, Karoo Lark *Calendulauda albescens* and Large-billed Lark *Galerida magnirostris*.

Photograph 3 – Examples of areas of natural vegetation within the Rondekop WEF proposed wind farm portions.

Buildings

As the site is mostly comprised of areas natural vegetation, the absence of significant amounts of man-made infrastructures is evident. Some houses were found in the broader area of the site (Photograph 4). These locations as well as others with similar characteristics (that may have been undetected during this monitoring campaign) may be important for several bird species which use them for roosting and/or nesting, such as Spotted Eagle-Owl *Bubo africanus*, House Sparrow *Passer domesticus*.

Photograph 4 – Man-made infrastructures with suitable characteristics for roosting or nesting of several bird species.

Trees

Other micro-habitats present within and in the area immediately adjacent to the proposed site, which are important for a number of bird species, are stands of trees. In the study area such trees are mostly associated with the presence of waterlines (Photograph 5).

These locations provide perching and roosting and/or nesting locations for raptor species as well as refugee for smaller passerine species (e.g. African Harrier-Hawk Polyboroides typus, Pied Crow Corvus albus, Grey Tit Parus afer and Karoo Thrush Turdus smithi, among others).

Photograph 5 – Scattered trees found in the middle of shrubland areas.

Conservancy areas

There are no nature conservancy areas, to our present knowledge, within a 30 km radius of the proposed development area. The proposed Rondekop WEF site is located approximately 40 km south-east of the Tankwa Karoo National Park, 50 km east of the Cedarberg – Koue Bokkeveld Complex IBA (SA101), 61 km north-west of the Anysberg Nature Reserve (SA108) and 90 km north-west of the Swartberg Mountains IBA (SA106) (Figure 44). **Considering that these areas are located at a considerable distance from the proposed WEF area it is not expected that the species using them are affected in any way by the implementation of this project. Nonetheless the analysis of the bird species present in these areas, which are of similar nature to the Rondekop WEF proposed area, may provide indication on the suite of species likely to be present in the study area.**

The **Tankwa Karoo National Park** is home to several Karoo endemic bird species. Among the species known to occur on the site there are the Burchell's Courser *Cursorius rufus*, the Double-banded Courser *Rhinoptilus africanus*, and the Karoo Long-billed Lark *Certhilauda subcoronata*. Additionally, species known to be sensitive to man-made infrastructures such as the Verreauxs' Eagle *Aquila verreauxii* and the Kori Bustard *Ardeotis kori* are widespread in the area (SANParks 2015).

The **Swartberg Mountains IBA (SA106)** is characterised by montane fynbos at higher altitudes and karroid and renosterveld shrubland on the lower slopes. The following are considered the IBA trigger species for this area: Globally threatened species - Martial Eagle and Black Harrier. Regionally threatened species - Verreauxs' Eagle, Lanner Falcon, Cape Rockjumper, Hottentot Buttonquail and African Rock Pipit. Common restricted-range and biome-restricted species - Cape Spurfowl and Cape Bulbul. Locally common restricted - range and biome-restricted species are Cape Sugarbird, Orange-breasted Sunbird, Cape Siskin, Karoo Korhaan, Karoo Chat, Layard's Tit-babbler, Black-headed Canary, Pale-winged Starling and Namaqua Warbler. Uncommon biome-restricted species - Victorin's Warbler, Cape Rockjumper, Protea Seedeater, Karoo Lark, Karoo Long-billed Lark, Sickle-winged Chat and Karoo Eremomela (BirdLife South Africa 2015a).

The **Cedarberg – Koue Bokkeveld Complex IBA (SA101)** stretches from the Groot Winterhoek Wilderness Area, with its eastern boundary running north along the Ceres–Op-die-Berg road and then turning east to Katbakkies to join the road running north from Karooport to Calvinia. The variation in edaphic factors, leads to a diverse flora, with mesic mountain fynbos grading into xeric succulent Karoo. The IBA trigger species for the Platberg Karoo Conservancy IBA are: Globally threatened species - Martial Eagle, Black Harrier and Ludwig's Bustard. Regionally threatened species - Verreauxs' Eagle, Lanner Falcon, Black Stork, Cape Rockjumper and Hottentot Buttonquail. Common Biome- and range-restricted species - Cape Spurfowl, Cape Bulbul, Cape Sugarbird, Orange-breasted Sunbird, Karoo Chat and Layard's Tit-babbler. Locally common Biome- and range-restricted species - Karoo Lark and Namaqua Warbler. Uncommon biome- and range-restricted species include Ludwig's Bustard, Karoo Long-billed Lark, Tractrac Chat, Sickle-winged Chat, Karoo Eremomela, Namaqua Warbler, Pale-winged Starling, Cinnamon-breasted Warbler, Black-headed Canary, Swee Waxbill *Coccopygia melanotis*, Cape Rockjumper, Protea Seedeater, Cape Siskin, Victorin's Warbler and Hottentot Buttonquail (BirdLife South Africa 2015b).

The **Anysberg Nature Reserve (SA108)** supports many Fynbos and Namib-Karoo biome-restricted species as well as many other arid-zone associated species. A total of 212 bird species have been recorded in the area so far, including the Ludwig's Bustard *Neotis ludwigii*, Karoo Korhaan *Eupodotis vigorsii*, Karoo Lark *Calendulauda albescens*, Karoo Chat *Cercomela schlegelii*, Karoo Eremomela *Eremomela gregalis*, Rufous-eared Warbler *Malcorus pectoralis*, Martial Eagle *Polemaetus bellicosus* and Black Harrier *Circus maurus*. Blue Crane *Anthropoides paradiseus* is also an occasional occurrence. The cliffs at this IBA are also known breeding locations for bird species such as Black Stork *Ciconia nigra*, Peregrine Falcon *Falco peregrinus*, Cape Eagle Owl *Bubo capensis*, Booted Eagle *Hieraaetus pennatus* and Verreauxs' Eagle. The IBA trigger species for the Anysberg Nature Reserve IBA are: Globally threatened species - Blue Crane, Ludwig's Bustard, Southern Black Korhaan *Afrotis afra*, Martial Eagle and Black Harrier. Regionally threatened species - Verreauxs' Eagle, Black Stork, Lanner Falcon *Falco biarmicus* and Cape Rockjumper. Common Range- and biome-restricted species - Cape Spurfowl, Cape Bulbul and Karoo Chat. Locally common range- or biome-restricted species - Karoo Korhaan, Karoo Lark, Layard's Tit-babbler, Karoo Eremomela and Namaqua Warbler. Uncommon range- or biome-restricted species - Ludwig's Bustard, Sickle-winged Chat *Cercomela sinuata*, Cape Rockjumper, Victorin's Warbler, Cape Sugarbird, Cape Siskin, Protea Seedeater *Crithagra leucoptera*, Orange-breasted Sunbird, Pale-winged Starling and Black-headed Canary (BirdLife South Africa 2015c).

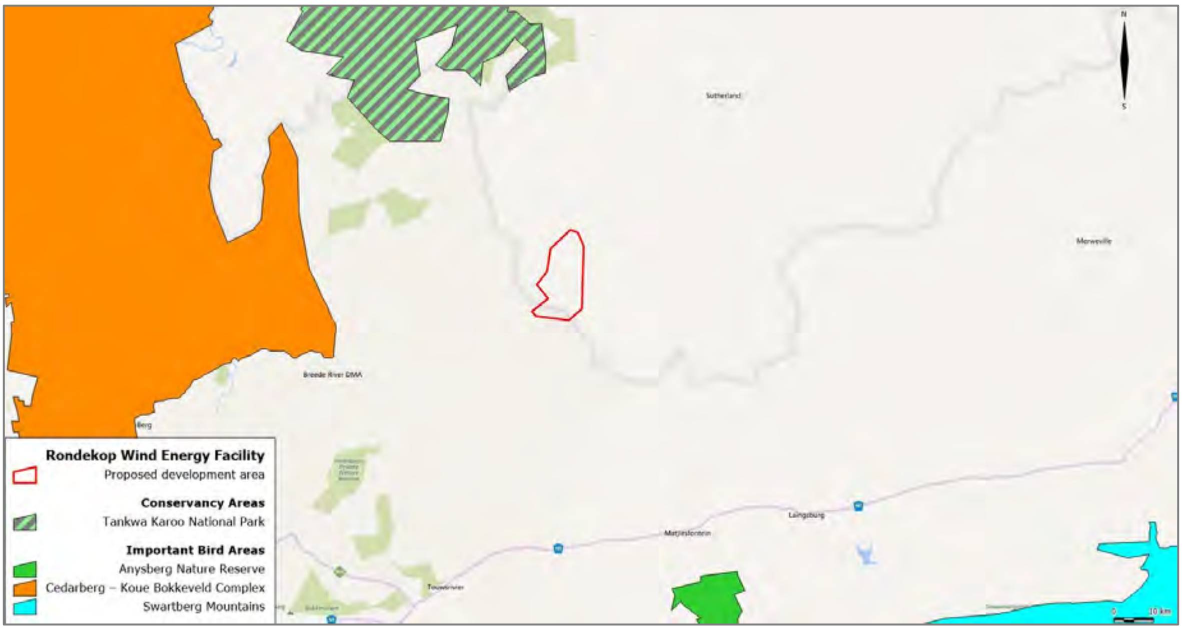

Figure 4 – Location of the Rendekop WEF in relation to the surrounding conservancy areas (background image source: Virtual Earth Street Map)

Cumulative impacts

The main known activities or projects, relevant for the cumulative impacts analysis, known in the broader area of the proposed Rondekop WEF are mostly the presence of power lines, roads and other proposed wind energy facilities. With present knowledge this is not considered likely therefore no additional cumulative impacts are foreseen due to the presence of additional power lines in the surrounding area of the site.

The presence of additional wind energy facilities has the potential to exacerbate the impacts for the general bird species in the area.

Potential cumulative impacts may materialise if the bird species using the Rondekop WEF also use the broader surrounding area, in that case, they will be subjected to an increased reduction in available habitat availability and increased collision risk with the wind turbines and associated infrastructure. If this happens fatality occurring at each of these sites should be evaluated together as impacts are most likely being caused over the same populations.

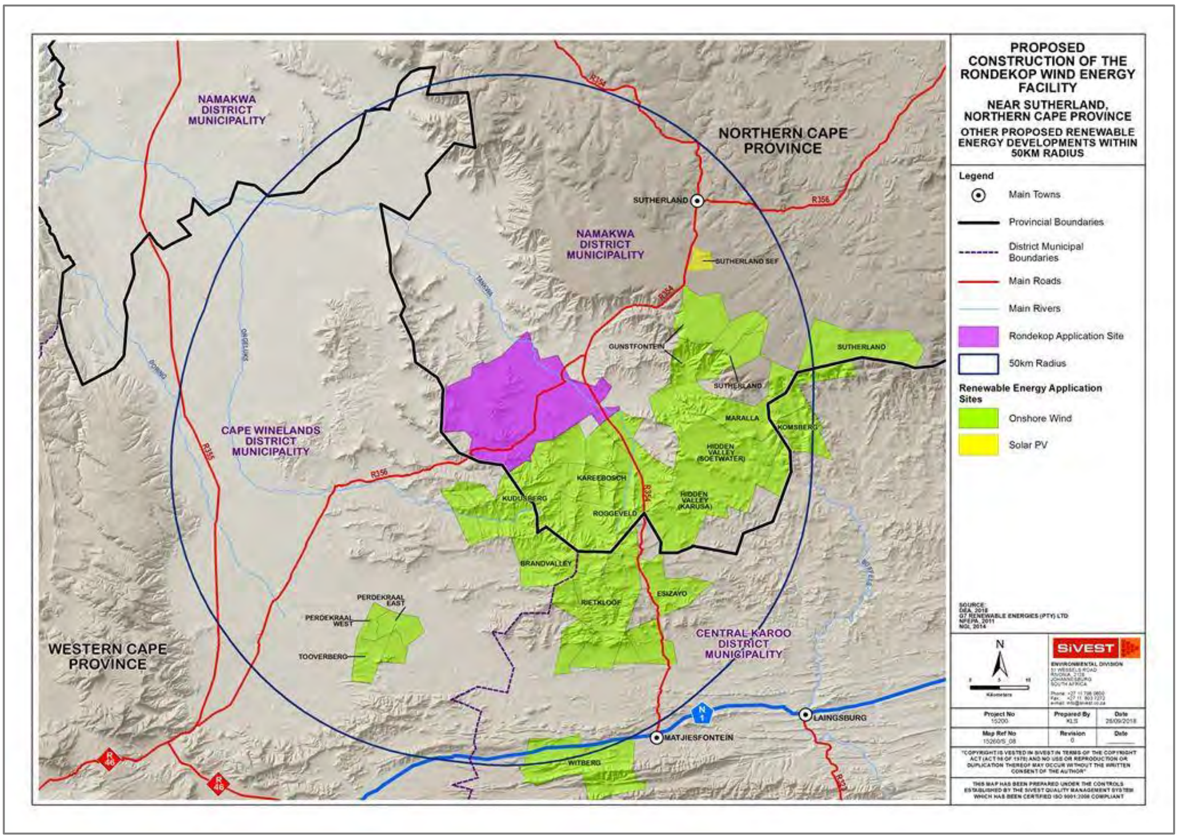

Figure 5 – Onshore Renewable Energy projects currently proposed or approved in the surrounding area of the Rondekop Wind Energy Facility (according to the REEA most recent available dataset – 2018 3th Quarter) (Map provided by SiVEST).

2. MONITORING PROGRAMME DESCRIPTION

The proposed methodology assumes as a baseline the requirements outlined by the most recent version of the *Best-Practice Guidelines for assessing and monitoring the impact of wind-energy facilities on birds in southern Africa* (Jenkins *et al.* 2015). Complementarily, the methodology is also based on current international good practice (Table 2).

2.1. Desktop preparatory work

Prior to the initiation of field surveys, a desktop survey was conducted to compile the best information possible, in order to provide a better evaluation of all conditions present within the study area. Therefore, data sources (as detailed in Table 2) were consulted in order to assess the species likely to occur within the study area. The following steps were taken:

- Based on a desktop study and considering all literature references available (Table 2), a list of all bird species considered to potentially occur within, or in close proximity to the site was compiled.
- Abundance of all species listed from the aforementioned process was assessed at a national level in terms of endemism, population trend, habitat preferences and conservation status.
- The sensitivity of these species towards the potential impacts from wind energy developments was evaluated using the Avian Wind Sensitivity Map (Retief *et al.* 2012). Other species not listed in the referred document were also considered sensitive because of their abundance, flight characteristics, ecological role, population trend and conservation status (refer to Section 2.1.1 for selection criteria).
- A short list of sensitive species for this study species, to which the assessment and monitoring programme should pay special attention to, was compiled based on the Avifaunal Scoping Report (Bioinsight 2016b), and supplemented with sensitive species identified in the previous steps.
- A desktop study, based on all the available information such as topographic South Africa maps, Google Earth imagery, and Geographical Information System software was conducted for a preliminary evaluation of the area.
- Micro habitats and vegetation units were characterised using Google Earth imagery and refined during the field visits conducted to the site through the monitoring programme.

The monitoring effort and methodological approach was defined and implemented.

The following data sources and reports (as per Table 2 below) were consulted and taken into consideration for the compilation of this report, in varying levels of detail. Many other references were consulted for particular issues (these are detailed in section 6).

Table 2 – Key Data sources consulted for the evaluation of the bird community present in the study area. The international references and guidelines used to support the methodological approach and result analysis are presented.

Type	Title	Bibliographic Reference	Detail of information
Data sources	South African Bird Atlas Project 2 (SABAP2)	http://sabap2.adu.org.za/	Local
	South African Bird Atlas Project 1 (SABAP1)	(Harrison *et al.* 1997)	Local
	Avian Wind Farm Sensitivity Map for South Africa	(Retief *et al.* 2012)	Pentad (5 x 5 minutes)

Type	Title	Bibliographic Reference	Detail of information
	Coordinated Avifauna Roadcounts (CAR)	http://car.adu.org.za/	Local level
	Coordinated Waterbird Counts	http://cwac.adu.org.za/	Local level
	Birds of Southern Africa	(Hockey, Dean & Ryan 2005)	National level
	BirdLife South Africa Checklist of Birds in South Africa 2016	(BLSA 2016)	National level
	The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland	(Taylor, Peacock & Wanless 2015)	National level
	Renewable Energy Application Mapping. Fourth Quarter 2018	(DEA 2018)	National level
	Global List of Threatened Species	(IUCN 2016)	Global level
Guidelines and other international references	BirdLife South Africa/Endangered Wildlife Trust best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa	(Jenkins *et al.* 2015)	National level Methodological approach
	Wind energy development and Natura 2000	(European Commision 2010)	International level Methodological approach and analysis
	Good Practice Wind Project	www.project-gpwind.eu/	International level Methodological approach and analysis
	Comprehensive Guide to Studying Wind Energy/Wildlife Interaction	(Strickland *et al.* 2011)	International level Methodological approach and analysis
	U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines	(USFWS 2012)	International level Methodological approach and analysis
	Directrices para la evaluación del impacto de los parques eólicos en aves y murciélagos	(Atienza *et al.* 2011)	International level Methodological approach and analysis
	Windfarm impacts on birds guidance	www.snh.gov.uk/	International level Methodological approach and analysis

2.1.1. Definition of the different types of surrogate species

A two-step approach was used to define abundance, distribution and flying patterns within the study area in order to evaluate the potential effects of development on the local bird community. Initially, the records of all bird species were included in the analysis to give an idea of their general use of the area and to define the composition of the community. In a second step, only species considered to be particularly sensitive to the impacts of wind energy facilities were considered in order to investigate particularities of species often scarcer and less frequently recorded.

These species were identified by implementing a structured decision process (refer to Figure 6) in which several factors related to the species' physiology and biology are considered, taxonomic order (Jordan & Smallie 2010), threatened status (Taylor, Peacock & Wanless 2015; IUCN 2016) ecological role (e.g. *Raptors* are considered to be key elements of the ecosystems and particularly vulnerable to collision with wind turbines (Strickland *et al.* 2011), endemism, abundance (Hockey, Dean & Ryan 2005) and population trend

(IUCN 2016). The sensitive species list also included priority species (Retief *et al.* 2012) and target species (Bioinsight 2016b)[1]. The sensitive species list identified for the proposed Rondekop WEF is presented in Table 1 (refer to section 1.1).

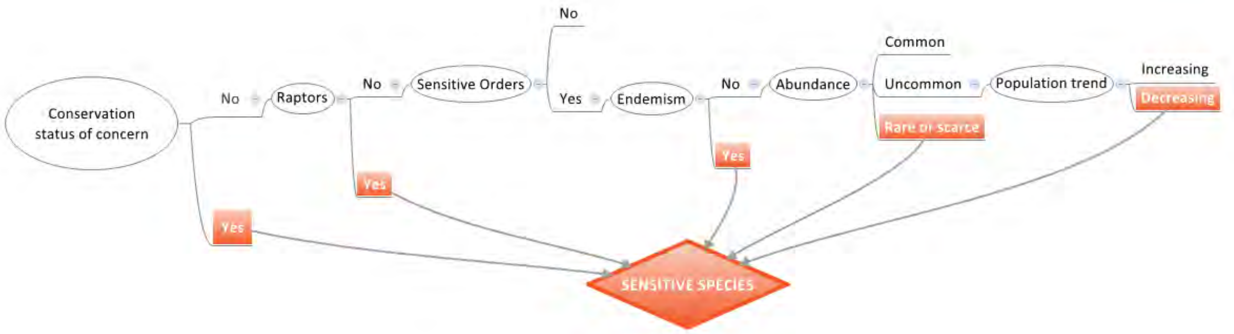

Figure 6 - Decision process scheme used to define sensitive species. A species is sensitive when following its characteristics through the scheme it ends in a red square. On the other hand, if it does not end up in a red square it would not be considered sensitive for the Rondekop WEF area.

The analysis of sensitive species, as a complement to the in-depth analysis of the results gathered for the general community, will provide valuable information on particular assessments, whether it would be cumulative effects, turbine micro sitting or post-construction Before-After Control-Impact. It also separates common, abundant events or species, from those scarcer or rare, allowing for its detection.

2.2. Field surveys

While the main emphasis of the pre-construction monitoring programme was focussed on the sensitive species identified (Table 1), a systematic approach was implemented in order to determine the general composition of the bird community within the study area, as well as to evaluate the potential negative effects that the operational phase of the Rondekop WEF has on this group. The surveys conducted involved the following methodologies (Appendix I - Figure 2829):

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[1] **Priority species -** Species listed in the Avian Wind Farm Sensitivity Map for South Africa (Retief *et al.* 2012). This list of species is considered a priority as it sets the basis for a common evaluation scheme in South Africa and therefore is believed that any species contained in these documents should be identified as a priority for conservation. The criteria used by Retief *et al*., 2012 were: species conservation concern - IUCN (2016) and *The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland* (Taylor, Peacock & Wanless 2015) - species endemism and species that might be sensitive to wind farms based on a bibliographic review and comparing to the groups affected in other parts of the world.

Target species - This is a shortlist of species defined by the Avian Specialist that conducted the previous stages of the EIA. This is stated in the *Best Practice Guidelines* (Jenkins *et al.* 2015). Based in their experience as well as project specifics, the specialist draws up a list of species to which special concern should be placed. In-detailed data for all species, particularly those under special concern, should be recorded in the field.

- Vantage points monitoring, to define the utilisation of the area by *Accipitrids, Falcons* and other large birds;
- Linear walking transects, to determine factors related to passerine and small bird communities on the wind energy facility site and the control area;
- Vehicle based transects, to complement the vantage point, nest and roost survey and aid in the definition of the distribution of some species not prone to flying, such as *Bustards* and, to a lesser extent, *Cranes*.
- Priority species nest survey, to locate and monitor active nesting sites of sensitive species within the study area and immediate surroundings;
- Waterbody monitoring, to evaluate the species present and their relevant movements at and between the main waterbodies.

All contacts of sensitive species during the driving and/or walking transects of the observers in the study area were recorded as incidental observations and were used as complementary data to characterise the bird community and its utilisation of the site, as recommended by the Best Practice Guidelines (Jenkins *et al.* 2015) and the previous stages of the Impact Assessment (scoping).

A Control area was considered for this project, being located approximately 2km south of the proposed WEF site (Figure 289). This area was selected due to it's extreme similarities to the study site, in terms of vegetation and topography. Both sites are equally comprised of Central Mountain Shale Renoserveld and Koedoesberge-Moordenaars Karoo vegetation (Mucina & Rutherford 2006). Additionally, both sites also exhibit mountaineous regions with shallow valleys. As such, very similar bird micro-habitats are expected to occur in both areas. Data gathered at this similar area will allow to compare the results obtained with a reference, non-affected area, in order to distinguish between impacts produced by the project and background effects produced by natural processes (SNH 2009; Atienza *et al.* 2011; Strickland *et al.* 2011; USFWS 2012; Jenkins *et al.* 2015).

2.2.1. Sampling Period

The surveys of the bird community monitoring programme were conducted between January and October 2016. The field surveys were conducted so that the area was surveyed through all seasons of the year, in compliance with the requirements of the Best Practice Guidelines (Jenkins *et al.* 2015). Therefore, the monitoring programme included a total of 8 visits to the site where all methodologies were implemented in each season: walked transects and vantage points, as well as other methodologies, spread over the pre-construction monitoring year.

Table 3 – Schedule of bird monitoring fieldwork at the Rondekop WEF site and Control area. VP – Vantage points; WT – Walked transects; VT – Vehicle transects; NE – Nest searches, inspection and monitoring; WB – Waterbody inspection and monitoring; Inc – Incidental observations.

Year	Month	Season	Methods
2016	12th to 22nd January	Summer	WT; VP; VT; NE; WB; Inc
	3rd to 13th February		WT; VP; VT; NE; WB; Inc
	1st to 11th April	Autumn	WT; VP; VT; NE; WB; Inc
	17th to 27th May		WT; VP; VT; NE; WB; Inc
	21st to 28th June	Winter	WT; VP; VT; WB; Inc

Year	Month	Season	Methods
	15th to 26th August		WT; VP; VT; NE; WB; Inc
	6th to 15th September	Spring	WT; VP; VT; NE; WB; Inc
	26th September to 5th October		WT; VP; VT; NE; WB; Inc

2.2.2. Weather conditions

Wind speed recorded by the observers during field surveys at Rondekop WEF and surroundings was constantly high, with a yearly average ranging from 3.1 to 4.3 m/s (depending on the season). Temperatures were lower during the winter season – averaging 15ºC, while higher temperatures were generally experienced during summer season, being recorded an average of 28ºC (Table 4). However, temperatures were mild throughout the year, with a variation of 13ºC between average lower and higher temperatures. Precipitation was more frequent in the winter season though small events were observed in all surveys (Table 4).

Table 4 – Prevailing meteorological conditions during surveys conducted. Avg Wind Speed – Average wind speed at ground level; Prevailing Cloudiness: 0-no clouds to 4-completely covered; Prevailing Precipitation: 0- no rain, * - periods of precipitation occurred; Avg Temp – Average temperature.

Year	Season	Avg Wind Speed (m/s)	Prevailing Wind Direction	Prevailing Cloudiness	Prevailing Precipitation	Avg Temp (°C)
2016	Summer	4.3	SE	1	0	28
	Autumn	3.2	W	1	0	18
	Winter	3.1	E	1	0	15
	Spring	4.3	W	1	0	16.2

2.2.3. Passerine and small bird communities – walked transects

To characterise the passerine and small bird communities occurring in the study area were used the walked transects methodology, as recommended in the best practice guidelines at the time (Jenkins *et al.* 2015). This is a technique used to produce estimates of densities/actual numbers of bird species - making it a very thorough and sufficient means of measurement for the application.

The following parameters were estimated for each species and transect, both in the wind energy facility as well as in the control area:

- Relative density, expressed as the number of birds per hectare, per study area (WEF and Control). This variable takes into account the probability of detection of the different groups of species into consideration.
- Occurrence of sensitive species in the vicinity of the proposed facility and its immediate surroundings.

Data collection techniques and methods

The passerine and small bird communities were characterised by conducting 13 linear transects of approximately 1000 m each, in total length – 5 located within the proposed Rondekop WEF area and 8 at a similar Control area. Linear transects were established by the previous service provider, after the completion of a desktop study and a preliminary inspection of the area by an expert bird specialist. These transects were validated by Bioinsight and are representative of the biotopes present within the study area (Appendix I – Figure 289).

Data analysis and criteria

The analysis of all collected data parameters allows for the detection of spatial and temporal variations being placed on the bird community occurring at the study area, as well as for important and/or special areas for sensitive species. Density estimation was conducted using Distance© 6.2 Release 1 (Thomas *et al.* 2010). Density estimation was applied to the general community using Conventional Distance Sampling analysis (Buckland *et al.* 1993, 2001) per season and per major biotope. A second analysis was conducted focusing on the groups of species with a higher frequency of detection (n ≥ 40).

2.2.4. *Raptors* and large birds – vantage points

Vantage points were used to detect sensitive species, focused on *Raptors* and other large birds. Therefore, a systematic approach to detect and characterise the species of this group, many of them endangered or sensitive species, was implemented. This methodology included a standard way of collecting data (e.g. flying patterns and characteristics), which allows for the comparison between different areas and sampling periods (SNH 2009; Atienza *et al.* 2011; Strickland *et al.* 2011; Jenkins *et al.* 2012).

This methodology allows the collection of accurate records based on the movements of *Raptors* and large birds through the study area. The main objectives for this methodology is to record the behaviour, estimate activity indexes and, if possible, determine the number of breeding pairs (if any) that frequently utilise the study area.

The following parameters were evaluated:

- Activity Index – determined by considering the number of contacts per observation hour. In this case every bird is considered a contact, thus a flock of five birds would be considered five contacts.
- Activity at Rotor Swept Area – determined by considering the number of contacts per observation hour spent in the space considered between the lower turbine blade tip and the upper blade tip.
- Time use at Rotor Swept Area – this parameter was determined by considering the amount of time spent at rotor height in relation to the total time spent flying through the area.
- Risk Analysis – The probability of collision of any bird species in the study area was determined by analysing the collision prone behaviours at a wide range of Rotor swept area ranging between 70 and 190m.

Data collection techniques and methods

Twelve vantage points were monitored throughout the monitoring programme, including six located at the Wind Energy Facility and six at the Control area. These sampling points were located at strategic locations within the Rondekop WEF site and Control area and set up to allow the visual coverage of the wind energy facility and its immediate surroundings. Since the area is very homogeneous with natural vegetation, drainage lines, and ridges all the vantage points cover all types of habitats (Appendix I – Figure 289).

Vantage point surveys were conducted accordingly to the most recent recommendation from the best practice guidelines at the time (Jenkins *et al.* 2015). Each location was surveyed for a minimum of 12 hours of observation per season divided through the early morning, midday and late afternoon times of day.

All the *Raptors* and large terrestrial bird species observed during this period were recorded and their flight paths registered. For each observation the number of individuals and, whenever possible, the gender and age was recorded. Behavioural patterns observed were also recorded. This included but were not restricted to:

- Type of flight – passage flight, soaring, display, territorial, etc.;
- Flight height[2] in relation to wind turbine height;
- Time – duration of the observation, and;
- Environmental conditions (air temperature, wind speed and direction, occurrence of precipitation, cloud cover and visibility).

Whenever pertinent, additional information was collected in order to contribute to the detailed characterisation of the usage of the area by each species.

During all the observers' movements within and around the study area (through slow driving or walking), all the contacts with *Raptors* and large birds (particularly those regarding pathway flights, flights at rotor swept height, hunting and display behaviours or those suggestive of important feeding, nesting or roosting sites) were recorded with the same detail as described above and were noted as "extra" or incidental observations (Jenkins *et al.* 2015). This methodology complemented the results from the vantage points and subsequently contributed to increasing the information regarding the distribution of the species over the relatively large study area.

Data analysis and criteria

All the data collected during the fieldwork (vantage points and complementary records recorded during observer's movements throughout the study area) were inserted into a geographical information system in order to map the areas used by sensitive species and to perform a spatial analysis of the results. This allowed the estimation of several indexes and parameters, calculated by analysing the distribution of the flight records throughout the area.

[2] Estimating the height of birds while flying can be challenging, especially during pre-construction phase when there's no physical height reference (e.g. such as power lines or wind turbines). This is overcome by the field observers by specific training in height estimation and extensive field work experience, aided by rangefinders in the field to constantly calibrate the observers distance bearings. The field measurements are, however, estimates to best reflect the reality so the data can be used to drawn fairly robust conclusions. The values for the lowest and highest tips of rotor swept area are obtained from the turbine characteristics and rounded to the nearest ten, always applying a precautionary approach and considering the largest swept area. Since the turbine specification has not yet been confirmed, the range between 70 and 190m was considered.

In order to assess variations in the spatial utilisation of the different bird species, the analysis was conducted for different groups based on particular characteristics relevant to their biology, ecology and behaviour. This classification is not just ecological[3], but rather practical and aiming to focus on the specific impacts likely to occur as a result of the installation of the wind energy facility, depending on the characteristics of the birds affected. Thus, the species were divided into (Table 1):

- *Accipitrids* - fairly large raptors, usually presenting a large wingspan and making use of thermal uplifts or hillside currents when soaring or gliding;
- *Falcons* - usually smaller raptors that make use of fast flight. Many of them display specific hunting behaviours such as hovering while looking for small prey. Some species tend to roost and hunt in large numbers,
- *Crows* - corvid species are classified within this group. They are usually common, widespread, opportunistic species. Although they often tend to fly at rotor height, they have not been found to be particularly affected by wind energy facilities. Sometimes they appear in large numbers and their populations are often unbalanced by the extra available resources found in human-influenced habitats.
- *Waterbirds* - mainly ducks, cormorants, geese and other waterbody-associated species (usually swimmers or divers) appear in this group.
- *"Ciconids"* - Ibis, Egrets and Herons mainly. While also being closely associated to water, these species are not swimmers or divers and are, in fact, often found away from actual waterbodies but in relatively muddy areas.
- *Bustards* – large to medium sized terrestrial birds, usually associated with agriculture areas where they tend to gather and forage. Includes bustards and korhaans, several of these species being endemic or near endemic to southern Africa. Most have the ability to make short commuting flights, while other species, can even migrate.
- *Phasianids* – mainly spurfowl, snipe, francolin etc. These birds are heavy, ground-dwelling birds with not much potential to at rotor heights.

2.2.5. Vehicle-Based Transects

As a complementary method, seven vehicle-based transects were conducted – four in the WEF and three in its immediate surroundings – measuring approximately between 5 and 9km each (Appendix I - Figure 289).

The purpose of the survey was to provide a measure of abundance and richness for those species observed (large terrestrial birds and raptors). At the same time, this information complements that obtained from the

[3] This classification is important as some common, generalised events may obscure other similar events that are more important and/or scarce. For example, while the apparition of a few kestrels hovering at a particular area is a quite a common sighting in the field, the sighting of a Martial Eagle occurs seldom. These events were meant to be clearly differentiated as to help define the possible impacts. Therefore, the classification is not just ecological but also practical. It aims to help represent important facts in order to assess particularities of the impacts that may be a result of the development.

vantage point surveys and aids in the detection of species less prone to flying, such as bustards. It also helps in detecting roosting and nesting sites as it covers extensive areas in a short period of time.

Each transect was conducted by two expert observers; one driving slowly and the other recording all of the contacts being seen or heard. During each linear transect, the total number of birds observed was counted and recorded. The following parameters were recorded: species and number of individual's present, perpendicular distance from the road, bird activity at the moment of observation and any additional notes that were considered relevant. If the contacts were seen flying, it was noted. The distance from the observer to the point where the bird was first detected was then recorded.

The following parameters were recorded and all records were taken note of on a standard field sheet especially designed for this methodological approach:

- bird species, gender and age (whenever possible);
- number of individuals;
- perpendicular distance from the road;
- bird activity observed and type of observation (acoustic/visual).

Whenever relevant, additional information was collected in order to contribute to the detailed characterisation of areas usage by the species.

2.2.6. Breeding Evidences

Surveys were conducted in the area in order to detect breeding evidences and/or roosting locations of sensitive species. These surveys took place in every season. The habitats located within the impact zone are likely to support key species, such as cliffs, power lines, stands of large trees, marshes and drainage lines (Malan 2009) which were surveyed by the combination of different inspection techniques according to the specifics of each site.

The location and status of the nests was determined by active searches and direct observations, by making use of a handheld GPS (Garmin® ETREX 10 and ETREX 20), a pair of binoculars and a spotting scope. After a nest was located, the observer spent time observing it. The following parameters were registered: type of nest (e.g. cliff, tree, pylon, building, rock cavity), vertical position at the supporting structure of the nest, orientation (north, south, etc.), status (e.g. good condition, bad condition, collapsed) and, whenever possible, construction phase (e.g. inactive, building, fixing, green branches). When an active nest was found, the following parameters were registered: reproduction phase (e.g. construction, incubation and chicks), presence of parents in the nest, number of eggs, number of descendants/flying offspring. Whenever relevant, additional information was registered according to observations found in the field.

2.2.7. Waterbody monitoring

Several waterbodies were identified within the proposed wind energy facility site or the surrounding. Therefore, these were mapped on a Geographical Information System by using 1:50 000 topographic maps and aerial photos and later surveyed in order to determine their level of utilisation by *Waterbirds* (Figure 289).

The water bodies found to be most relevant (due to their size and ability to hold water in the rainy season) were visited by two expert observers at least twice during the pre-construction monitoring campaign (at least once in winter and once in summer), in accordance with (Taylor *et al.* 1999). The observers were aided by a pair of binoculars and a spotting scope. Whenever a relevant water body was found to be present, the methodological approach followed the established methodologies for the Coordinated Waterbird Counts (Taylor *et al.* 1999). The observations were made simultaneously by two observers, from a fixed point, for a minimum of 30 min, and was generally conducted during the same hours (mostly in the midday) across the entire monitoring campaign, as far as possible. The species present were then recorded at the beginning of the observation. For the remaining period, the observer recorded the main movements around the water body. The following parameters were registered: species and number of birds present, gender and age (adult, juvenile/chicks) (whenever possible), direction of arrival/departure from the water body and any additional notes that may have been important.

2.3. Assumptions & Limitations

- The pre-construction bird monitoring is based on both primary (data collection) and secondary data sources, such as those indicated in section 2.1.
- Any inaccuracies or lack of information in the bibliographic sources consulted could limit this study. In particular, the SABAP1 data is now fairly old (Harrison *et al.* 1997). To surpass this possible problem in the data used, the more recent and updated SABAP2 was consulted. However, the number of lists submitted for this area in the SABAP 2 is not yet adequate for the single use of this more recent data source. Therefore, both South African Bird Atlases (Project 1 and 2) were consulted in a complementary way. Species were considered as being possibly present within the study area if they occurred in any of the pentads, QDGS or wetland sites considered for analysis. Coordinate Avifauna Roadcounts data and Coordinated Waterbird Counts data was also requested for consideration in this study.
- As vantage points had good visibility conditions (covering many of the proposed turbine locations), it was assumed that not only flying birds but also individuals on the ground should be detected. However, large terrestrial birds which do not fly often or spend long periods on the ground, would be more difficult to detect on hilly or wooded areas. This fact directly implies that activity indexes for these species can be underestimated. To deal with this issue a vehicle based transect was set up in the development area. This allowed moving through the area and having different perspectives over topographic features - therefore increasing the chance of detecting these type of birds, though activity indexes obtained through these two different methods cannot be directly compared.
- Vantage point surveys are only conducted during daylight. Therefore, any bird movement occurring at night is not recorded.
- At this stage, no inter-annual variations are taken into consideration as only one year of data has been collected. Nevertheless, the basis for comparisons with subsequent years has been established.
- The recommendations on the current version of the applied guidelines were followed to the maximum extent possible and exceeded whenever feasible. The methodologies implemented were adjusted to the specificities of the area. Compliance and any deviations from the guidelines are presented in this report.

3. RESULTS AND DISCUSSION

The results presented in this report consider the information recorded during the pre-construction bird monitoring programme for the Rondekop WEF undertaken across all four seasons. Therefore, they constitute a baseline reference for the bird communities in a pre-construction scenario. The discussion is based on the analysis of data collected and specialised bibliographic information available.

3.1. General results

From a total of 131 species potentially occurring in the area (Bioinsight 2016a), a total of 67 bird species were detected within the study area (WEF and surrounding area) across all the survey methodologies implemented through the pre-construction monitoring, including eight species that were not identified as occurring at the site in the Scoping phase (Appendix II). Twenty five (25) of the species identified are considered to be sensitive species, while seventeen (17) of these same twenty five (25) are considered as priority species due to impacts caused by wind energy facilities (Table 1).

Out of the total species identified, six (6) are of special concern for having an unfavourable conservation status in South Africa (Appendix II): Black Harrier *Circus maurus*, Ludwig's Bustard *Neotis ludwigii*, Martial Eagle *Polemaetus bellicosus* – Endangered; Verreauxs' Eagle *Aquila verreauxii*, Black Stork *Ciconia nigra* – Vulnerable; Greater Flaming *Phoenicopterus roseus* – Near Threatened (Taylor, Peacock & Wanless 2015). A description of these species occurrence in the study area is given in Appendix IV of this report.

Eleven (11) species detected during field work are considered to be endemic or near endemic to South Africa including sensitive species such as Jackal Buzzard, Karoo Lark, Black Harrier, Large-billed Lark and Cape Clapper Lark (Appendix II).

The bird community at the study area (67 total bird species) was mostly composed by passerine and small bird species (43% of the total species), followed by bird species associated with waterbodies (28% of the total bird species), *Accipitrids* (10% of species) and *Ciconids* (10% of species). Representing a smaller proportion, 7% of the species found in the study area were *Bustards, Falcon* or *Crow* species (Table 5). From the aforementioned groups the *Raptors (Accipitrids), Falcons, Waterbirds* and "*Ciconids*" are considered most likely to suffer impacts caused by wind farms (Retief *et al.* 2012). Passerines might also be sensitive to impacts and collide with wind turbines, especially those which conduct migrations (AWWI 2015).

A large portion of the species confirmed in the area were observed at both the proposed wind energy facility site and the surrounding area (33 species – 49% of the total species observed). These species may not be severely impacted by the wind energy facility presence as they already use the surrounding area, being therefore possibly able to shift their utilisation area slightly. These include most of the priority species present at the site (12 out of 17 species), of which 7 are *Accipitrids* and *Falcons* species, considered to have a higher vulnerability to collision, especially if using the development site only (AWWI 2015).

Thirteen (13) of the remaining species were observed using only the WEF site, being these *Waterbirds*, *Ciconids* and *Passerines and small bird species* – from these only two species are considered sensitive to impacts caused by wind energy facilities (Table 5).

A higher number of species were detected using only the Control area. Such species are considered to be less likely to be negatively impacted by the Rondekop WEF as they do not regularly use the area where the WEF will be constructed. They may however be somewhat affected by the disturbance caused by the temporary construction activities which can have repercussions to the broader study area. Additionally, it is of note that they may also use the WEF area, though they have not been observed doing so.

Table 5 – Number of species observed at the Rondekop WEF and Control (CO) area, considering their sensitivity to impacts caused by wind energy facilities (refer to Table 1).

Group of species	WEF only		CO only		WEF & CO	
	Total Non-sensitive	Sensitive	Total Non-sensitive	Sensitive	Total Non-sensitive	Sensitive
"Ciconids"	3	1	4	2	7	3
Bustards	0	0	1	1	1	1
Crows	0	0	1	0	3	0
Falcons	0	0	0	0	1	1
Passerines and other small birds	4	0	12	1	29	4
Raptors (*Accipitrids*)	0	0	2	1	7	6
Waterbirds	6	1	3	1	19	3
Total	**13**	**2**	**23**	**6**	**67**	**18**

3.2. Passerine and small bird communities

Amongst the diverse community of passerine species and similar small bird species four sensitive species were observed using the WEF site and surrounding area: Cape Clapper Lark *Mirafra apiata*, Grey-winged Francolin *Scleroptila africana*, Karoo Lark *Calendulauda albescens*, Larged-billed Lark *Galerida magnirostris*, (Table 6). From the aforementioned species none have a conservation status of concern (Taylor, Peacock & Wanless 2015; IUCN 2016). Due to their ecological characteristics these species are regarded as sensitive to habitat related impacts, such as disturbance and displacement. A particular notice is given to larks as they usually perform aerial displays during the breeding season, which extends from about August to November in the area (Hockey *et al*. 2005). These aerial displays can extend to very high altitudes, potentially entering the collision risk area (i.e. the rotor swept area), and leading to fatalities of some individuals due to collision with rotating turbine blades. Though larks were present at the WEF site, they were not abundant nor frequently observed. Swifts and swallows are also considered to be potentially susceptible to collisions with wind turbines due to their migration pattern (Strickland *et al.* 2011; AWWI 2015).

Considering the whole year of monitoring, the passerine community observed at the WEF site and Control area presented similar compositions and abundances. This indicates that the Control area chosen is an adequate representative of the WEF site and additionally is regarded as alternative habitat for some of the species present, being this the case for three of the sensitive species detected: Large-billed Lark, Karoo Lark and Rock Kestrel.

Species from this group were particularly abundant in winter and spring with both a medium relative abundance and estimated density (Table 6; Figure 7). The same trend was observed regarding species richness, with a higher number of species detected both at the WEF and Control areas in winter and spring seasons. This increase of activity during spring season is most likely due to a higher conspicuousness of most resident passerine species which are more vocal for breeding purposes. Additionally, in situations where wind speed is in favour of the observers it will increase detectability of most passerine species.

Considering the most abundant groups of passerine bird species, a specific analysis of their density was conducted and is presented in Figure 8. Cisticolas, represented by Grey-backed Cisticola, Karoo Prinia, among others were particularly abundant in the study area in the autumn season. Buntings (Cape Bunting) especially occurred in spring season. Flycatchers are more abundant in spring and autumn seasons. Larks, were mostly detected during spring season. Lastly, Shrikes abundance is higher in the autumn season.

Table 6 – Main results for passerines of the walked transects conducted at the Rondekop WEF and Control area.

Season	Avg. number of contacts/transect	Avg. number of species/transect	Sensitive species	Non- Sensitive Abundant species
Summer				
WEF	9.8	7.4	Large-billed Lark	Karoo Scrub Robin
Control	6.6	4.3	Large-billed Lark; Grey-winged Francolin	Bokmakierie; Karoo Scrub Robin
Autumn				
WEF	16.6	13	Large-billed Lark; Karoo Lark	Grey-backed Cisticola
Control	9.6	7.5	Large-billed Lark; Karoo Lark	Bokmakierie; Cape Bunting
Winter				
WEF	17.6	14.2	Rock Kestrel; Large-billed Lark	Cape Bunting; Grey-backed Cisticola
Control	30	19.6	Cape Clapper Lark; Large-billed Lark	Bokmakierie; Cape Bunting; Cape Sparrow; Grey-backed Cisticola; Mountain Wheatear
Spring				
WEF	21.2	16.6	Large-billed Lark; Karoo Lark	Cape Bunting; Grey-backed Cisticola
Control	17.8	13.4	Rock Kestrel; Black Harrier; Large-billed Lark	Cape Bunting; Grey-backed Cisticola; Karoo Scrub Robin; Mountain Wheatear

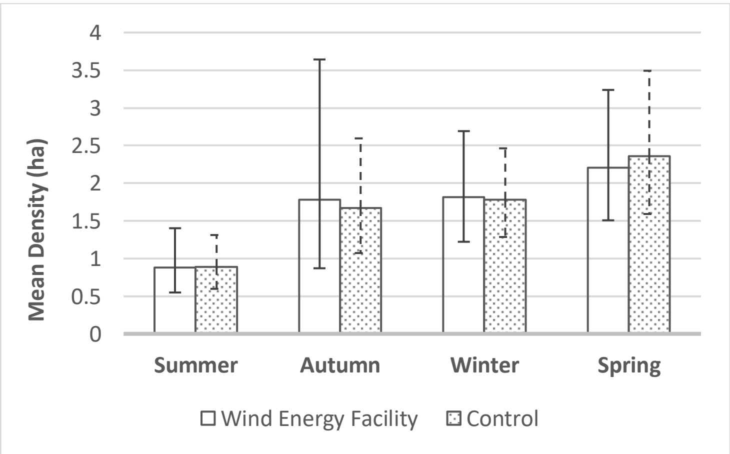

Figure 7 - Estimated densities of the general small bird community per season detected at Rondekop WEF and Control area during pre-construction monitoring programme.

A summary of the observations of sensitive passerine and small bird species is given below. These include Large-billed Lark, Karoo Lark, Cape Clapper Lark and Grey-winged Francolin.

Large-billed Lark (*Galerida magnirostris*), a near endemic species to South Africa, is known to display during the breeding season in circling flights, 15 to 50 m high (Hockey, Dean & Ryan 2005). This would be the passerine species considered to be the most sensitive species to collision with turbine blades as it is the only one known to enter a rotor swept area bellow 50/60m. It selects semi-arid environments and also cereal crops and degraded rangelands (Hockey, Dean & Ryan 2005). In the study area it was observed at BTRK01, 04, 05, 06, 08 (WEF) and BTCO01, 02, 03, 04, 05, 06, 07, 08 (CO), during all seasons, indicating a very widespread distribution in the area.

Karoo Lark (*Calendulauda albescens*), a near endemic species to South Africa, displays flying 15-25 m high (Hockey, Dean & Ryan 2005). Occurs in open, sandy shrub, avoiding generally agricultural areas, although it is tolerant to old fallows and areas recolonized by shrubs (Hockey, Dean & Ryan 2005). Karoo Lark was observed during autumn and spring, at the walked transects both in WEF (BTRK01 and BTRK08) and control (BTCO05).

Cape Clapper Lark (*Mirafra apiata*) is a near endemic species to South Africa. Displays rising steeply in the air (Hockey, Dean & Ryan 2005). Occurs in dense shrubland but also tolerates cereal crops if they are densely covered and about natural vegetation (Hockey, Dean & Ryan 2005). Only one individual of this species was detected once during the winter season, at the walked transect BTCO01. The lack of observations in the remaining surveys or even at the WEF area suggest that the species may not use the proposed WEF site frequently and that the identification made may be of a vagrant individual instead of a resident species.

Grey-winged Francolin (*Scleroptila africana*), is endemic to South Africa and Lesotho. This species is considered sensitive to impacts caused by wind farms due to habitat loss and potential displacement effects, and it is not known to fly at rotor swept area (Hockey, Dean & Ryan 2005). This species was seldom detected at walked transect BTCO06 (CO) during summer, and from Vantage Point VPCO02 (CO) during winter,and VPCO06 (CO) and VPRK05 (WEF) during autumn. Though widespread its distribution in the area appears to be sparse, most likely due to the detection difficulties related to this species camouflage plumage.

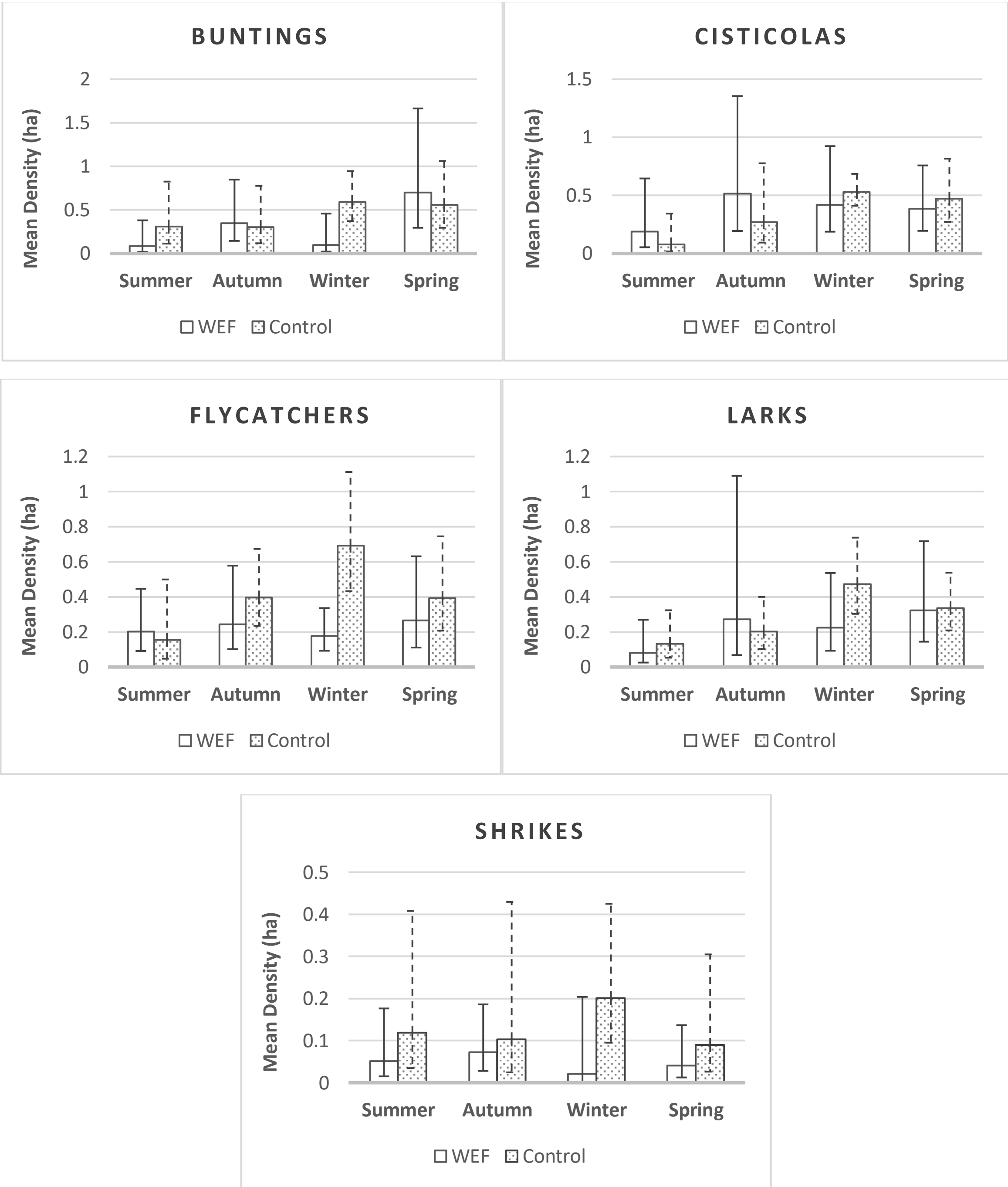

Figure 8 – Estimated densities of the most frequent passerine groups of species per season detected at Rondekop WEF site and Control area during pre-construction monitoring programme.

3.3. Raptors and large birds

General community

A total of seventeen (17) species of *Raptors, Falcons* and other large birds were observed in the study area and its surroundings (including seven Raptors, three "Ciconids", three species of Corvid, two Waterbirds, one Bustard and one Falcon species), through all methodologies implemented.

Activity calculated through standardised metrics (i.e. vantage points) in the proposed WEF and surrounding area was very variable considering the groups with occurrence in the study area (Figure 9). While *Accipitrids*, *Falcons* and *Waterbirds* were observed throughout the whole year (or most of the year), *Crows* were detected only in spring seasons. *Phasianids* were observed only in autumn and winter through vantage points and in WEF walked transect during summer.

Accipitrids were mostly active in the summer season (approx. 0.059 contacts/hour), showing a decrease in autumn, spring and winter (approx. 0.029, 0.028 and 0.022 contacts/hour, respectively). *Falcons* on the other hand have shown a more irregular activity pattern, with general peak of activity in the summer season (approx. 0.078 contacts/hour) and much lower activity levels in the autumn and spring (around 0.008 and 0.021 contacts/hour). *Falcons* were also quite active in winter, when a general activity of 0.044 contacts/hour was recorded. Also, *Waterbirds* showed an irregular activity pattern recording higher activity in autumn and spring (approx. 0.039 and 0.033 contacts/hour) while and no activity was registered in the summer season.

In general, bird activity detected, as well as the gliding and hunting movements of species observed during vantage point hours were concentrated in the escarpment and hillside areas, followed by areas of natural vegetation with sparse coverage (Figure 15; Figure 16; Figure 17). These areas also coincide with the locations where contacts at RSH were more abundant (Figure 24), and generally where the highest amount of time was also spent at RSH (Figure 18). In the proposed development area, the highest number of movements of birds were detected in the close proximities of the VPRK04 and VPRK05.

While vantage points allowed to determine in a more consistent way the spatial utilisation of the area by a general list of species, vehicle-based transects were also useful in detecting general abundance of potentially less aerial species, such as Black Stork, among other sensitive species. Figures of the contacts recorded through vehicle-based transects are shown in Table 7. Activity recorded through this method was higher in the spring season, also due to a higher number of species observed, while the activity in the WEF site was relatively constant throughout the year, apart from a slight peak during winter (summer, autumn and spring: 0.04 contacts/km; winter: 0.16 contacts/km). In the Control area, the average number of detection was more irregular, with no detections recorded in the summer and autumn, followed by a peak in the winter and spring seasons. Amongst the sensitive species detected through this method, besides the aforementioned Black Stork, are included Martial Eagle, Rock Kestrel, Jackal Buzzard, Pale Chanting Goshawk, Black Harrier. Also, a Black Harrier was observed trough the walked transects methodology (BTCO03).

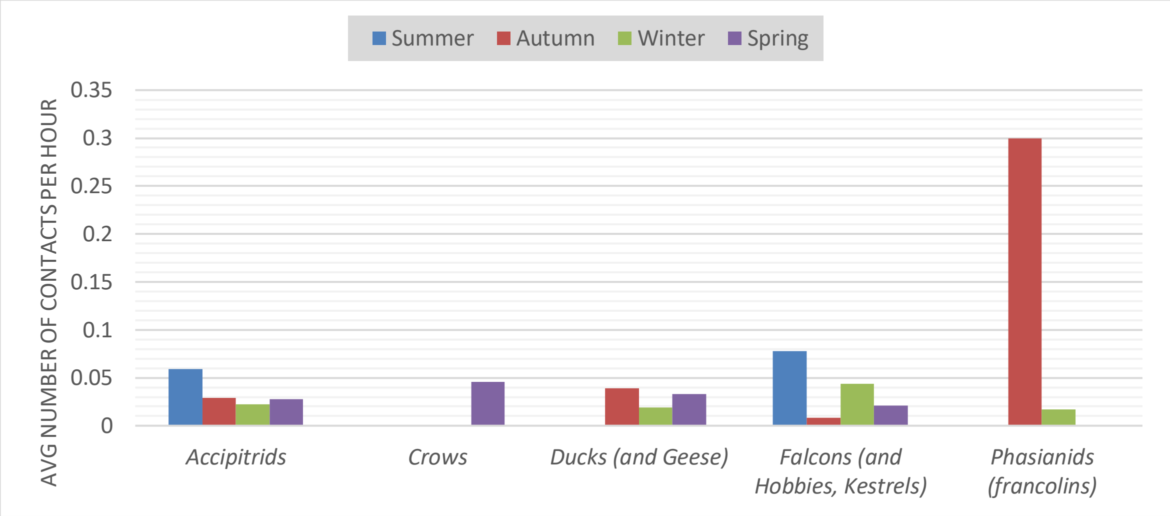

Figure 9 - Average number of contacts per hour for the general bird community obtained through the vantage points conducted during the bird pre-construction monitoring programme.

Table 7 – Main results of the vehicle based transects conducted at the Rondekop WEF and Control area.

Season	Avg. number of contacts/km	Avg. number of species/transect	Sensitive species
Summer			
WEF	0.04	0.25	Martial Eagle
Control	0	0	-
Autumn			
WEF	0.04	0.25	Martial Eagle
Control	0	0	-
Winter			
WEF	0.16	0.5	Jackal Buzzard; Pale Chanting Goshawk
Control	0.05	0.33	Rock Kestrel
Spring			
WEF	0.04	0.25	Pale Chanting Goshawk
Control	0.14	0.75	Black Harrier; Black Stork; Rock Kestrel

Accipitrids and *Falcons*

Compared with other groups of species, *Raptors* and *Falcons* represent a larger number of species of concern and a diverse community. These two different groups might differ in habits and behaviour: *Falcons*, small fast flyers and Accipitrids, larger, soaring *Raptors*, however they are common in their higher vulnerability to collision with wind turbines and higher susceptibility to population decrease due to longer lifespan and lower reproductive rate when compared with passerine species for example (AWWI 2015). From these two groups, a total of 8 species were detected in the study area and surroundings and were all are considered sensitive to impacts caused by wind energy facilities: African Harrier-Hawk, Black Harrier, Black-chested Snake Eagle, Jackal Buzzard, Martial Eagle, Pale Chanting Goshawk, Rock Kestrel and Verreauxs' Eagle. Three of these species are of conservation status of concern: Verreauxs' Eagle (*Vulnerable*), Black Harrier and Martial Eagle (*Endangered*) (Taylor, Peacock & Wanless 2015). A description of the movements and general occurrence of these species is supplied in Appendix IV.

As mentioned in relation to Figure 9, *Accipitrids* and *Falcons* are included in the species with the most frequent and abundant occurrence in the study area. Analysing the spatial utilisation of these groups in relation to the biotope distribution it was evident that most contacts for both groups were in hillside areas (Figure 10). This is not unusual as soaring birds who tend to use slope areas to gain lift and soar through the area. Additionally, *Falcons* more frequently used areas of open natural vegetation, without tree coverage, while *Accipitrids* showed a different pattern, preferring areas of natural vegetation with sparse trees. Riverine vegetation and drainage lines was also actively used both by *Falcons* and *Accipitrids*.

In terms of the time spent at rotor swept height, *Falcon* and *Accipitrid* species spend a large portion of their time at rotor swept height (RSH), except during autumn (for both the WEF and CO areas).

- *Accipitrid*: average of 29% in spring, 84% in summer, 31% in winter of the total time observed at the study area and
- *Falcon*: average of 91% in spring, 48% in summer, 52% in winter of the total time observed at the study area (Figure 22).

To this elevated percentage some species had a higher contribution than others, including the Rock Kestrel, the Verreauxs' Eagle and the Martial Eagle which spent most of the recorded time flying at RSH.

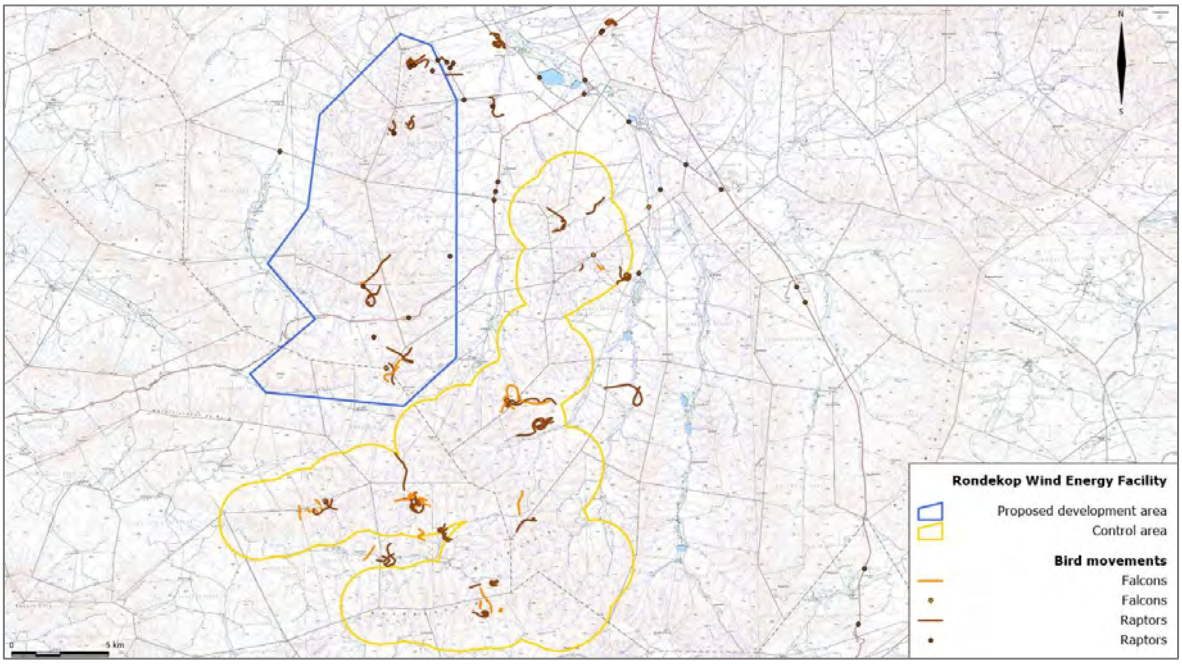

Figure 10 – Distribution of *Accipitrid* and *Falcon* movements collected through the bird monitoring programme at the proposed Rondekop WEF.

Bustards and Cranes

Bustards were represented by the presence of Ludwig's Bustard in the study area only, while no Crane species was observed in the study area (refer to Appendix IV for more details on the observations of this species). Both species groups are considered sensitive to impacts caused by wind energy facilities. Ludwig's Bustard was only detected in spring through vantage points, thus no standardised calculations could be made regarding its activity in the area (Figure 11). However, no flights at RSH were observed hence the potential collision probability for this species is expected to be low. It is of note, that the movements of Bustards were only detected in the Control area.

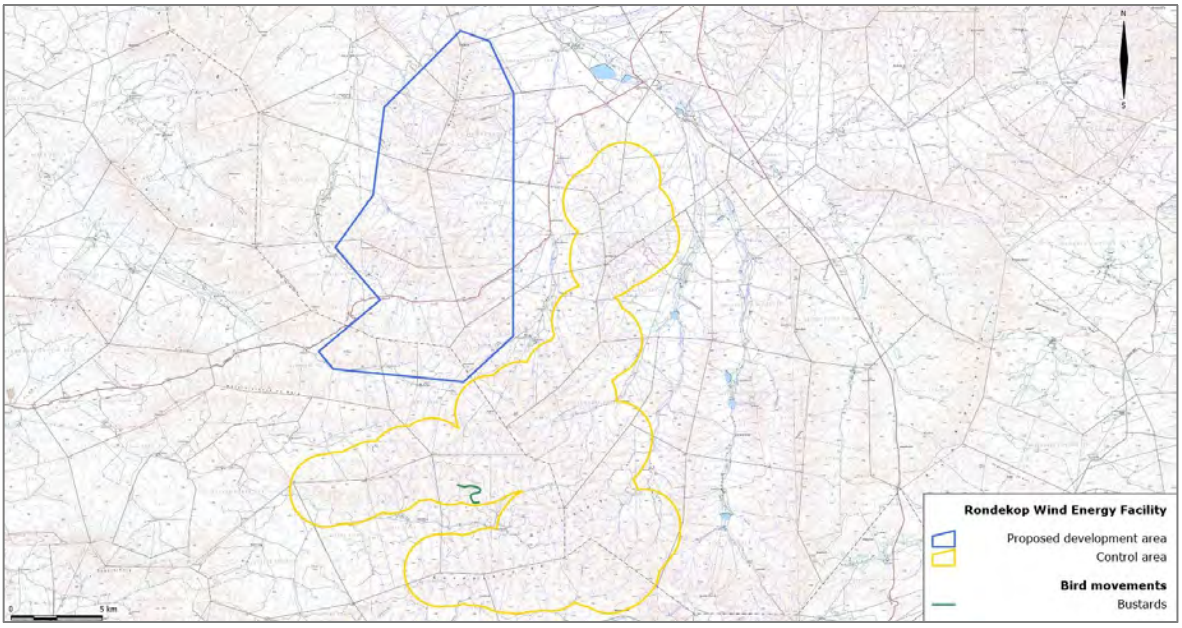

Figure 11 – Distribution of *Bustards* (Ludwig's Bustard) movements collected through the bird monitoring programme at the proposed Rondekop WEF – no movement within project site.

"Ciconids"

"*Ciconids*" was not particularly abundant at the study area, however, the occurrence of at least three sensitive species was confirmed: Black Stork (during winter), as well as the Hamerkop and African Spoonbill (during spring). The observations of this group were made through non-directed methodologies both in WEF and Control area, but in spite of this, a single very brief flight was observed at RSH, of one Black Stork in the Control area. The remaining detections of this group occurred in the Control area as well, being three individuals of African Spoonbill observed foraging on the ground, and one Hamerkop gliding below the RSH (Figure 12).

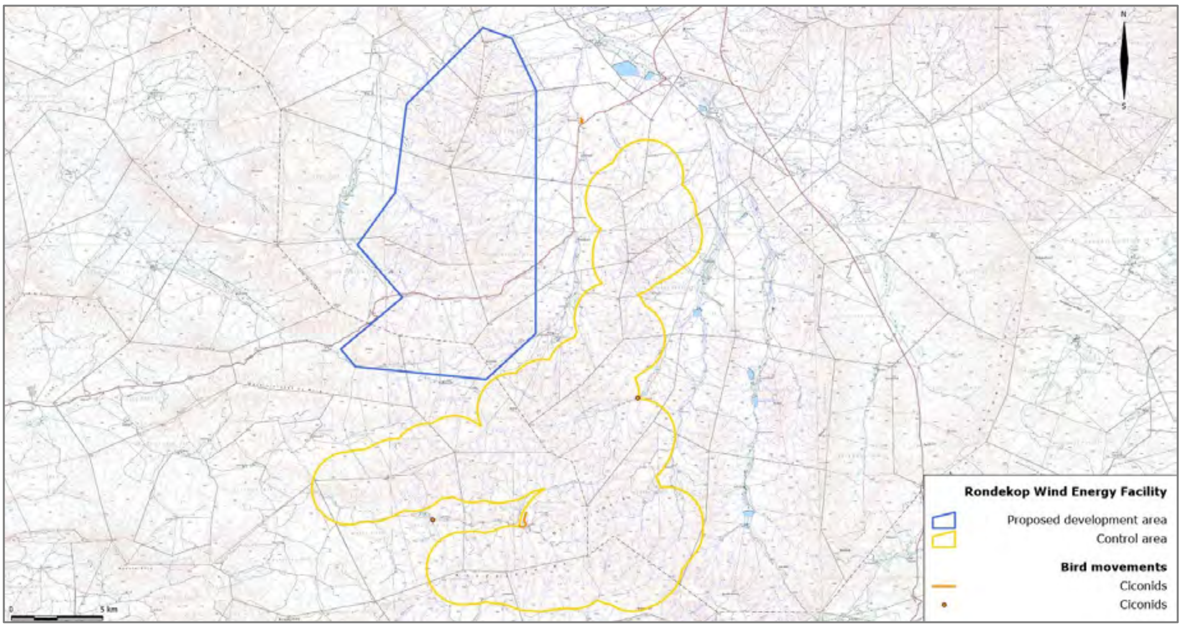

Figure 12 – Distribution of *"Ciconids"* movements collected through the bird monitoring programme at the proposed Rondekop WEF – no movement within project site.

Crows

Three Corvid species were detected in the study area: Cape Crow, Pied Crow and White-necked Raven. None of these species has a conservation status of concern nor is considered sensitive to impacts caused by wind energy facilities. However, it is of note that 22% of the flights documented through vantage points methodology for Pied Crow were recorded at RSH, and occurred in the control (CO) area (Figure 13; Figure 22). In spite of absence of fatality records of Corvid species at wind energy facilities this is a risk that could contribute to a higher collision probability for this species during the operational phase of the project.

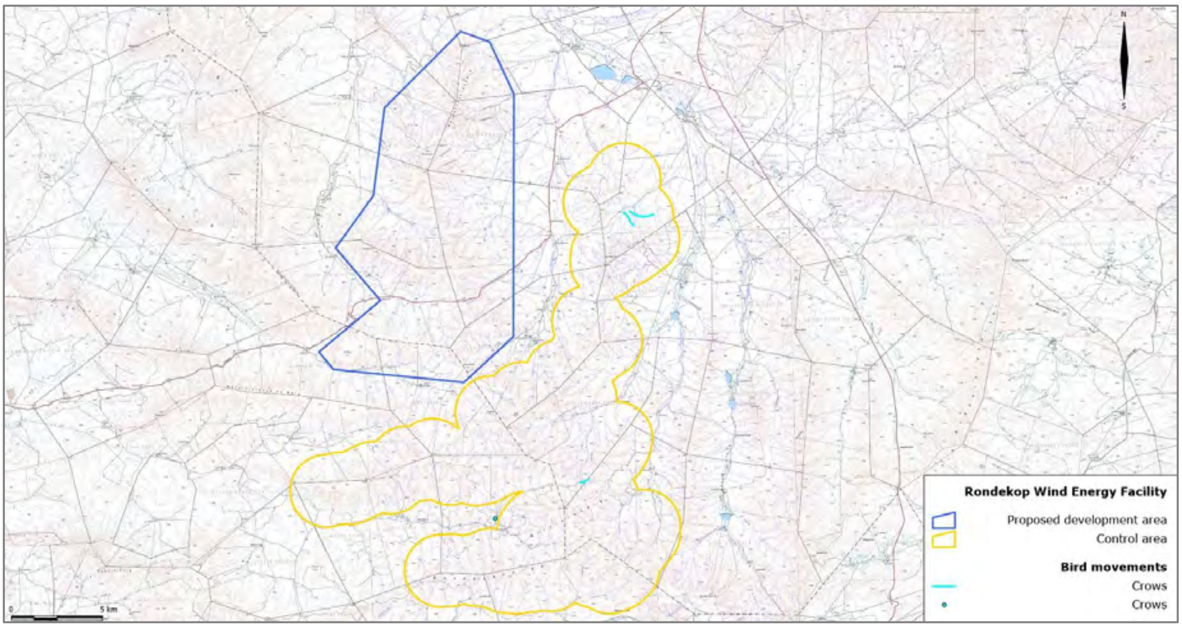

Figure 13 – Distribution of the *Crows* movements collected through the bird monitoring programme at the proposed Rondekop WEF.

Waterbirds

Waterbird species recorded at the study area included Egyptian Goose, and South African Shelduck. None of these species presents a conservation status of concern or is considered sensitive to impacts caused by wind energy facilities. It is of note the high utilisation of the RSH by both species, during autumn and winter while commuting through the area (Figure 14; Figure 22). Movements observed occurred both in the proposed WEF and in the Control area (Figure 14).

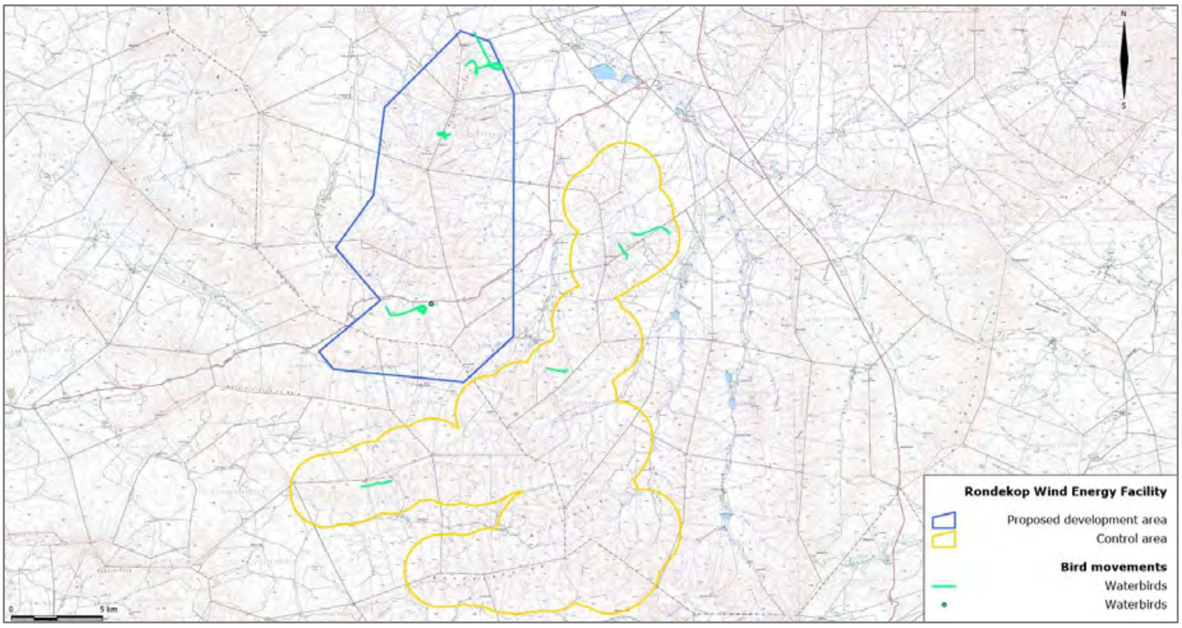

Figure 14 – Distribution of the *Waterbirds* movements collected through the bird monitoring programme at the proposed Rondekop WEF.

General considerations

In terms of community composition and general utilisation of the proposed site some aspects are highlighted as of special concern:

- A constant and higher activity of *Accipitrids* and *Falcons* has been observed throughout the year. Both groups of species also spent a higher proportion of their time flying at rotor swept height (between 40m and 230m). This is regarded as the dominant group of sensitive species at the site, due both to their conservation status and high likelihood to collide with rotating wind turbines (collision risk analysis is presented in section 3.6);
- Remaining groups have demonstrated a sparser occurrence and lower activity levels at the site. Nonetheless some species, such as South African Shelduck, Egyptian Goose and Pied Crow conducted flights at rotor swept height, indicating a certain degree of collision probability. This will be evaluated in section 3.6;
- General activity was particularly associated with the hillsides which compose a big portion of the proposed WEF site. These areas were particularly important for *Accipitrids* and *Falcons* since most of the flights observed concentrated around these features. Riverine vegetation and drainage lines was also actively used both by *Falcons* and *Accipitrids*.

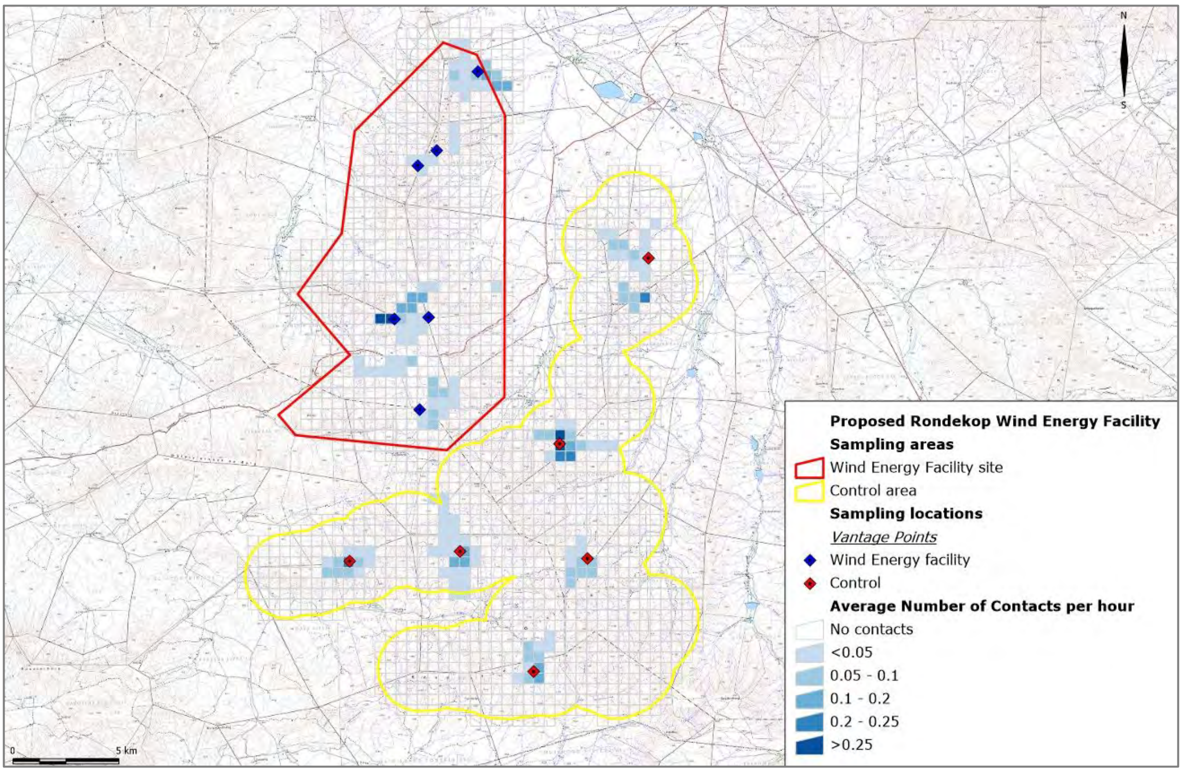

Figure 15 – Average activity recorded through vantage points for all bird species during the 12-month pre-construction bird monitoring programme.

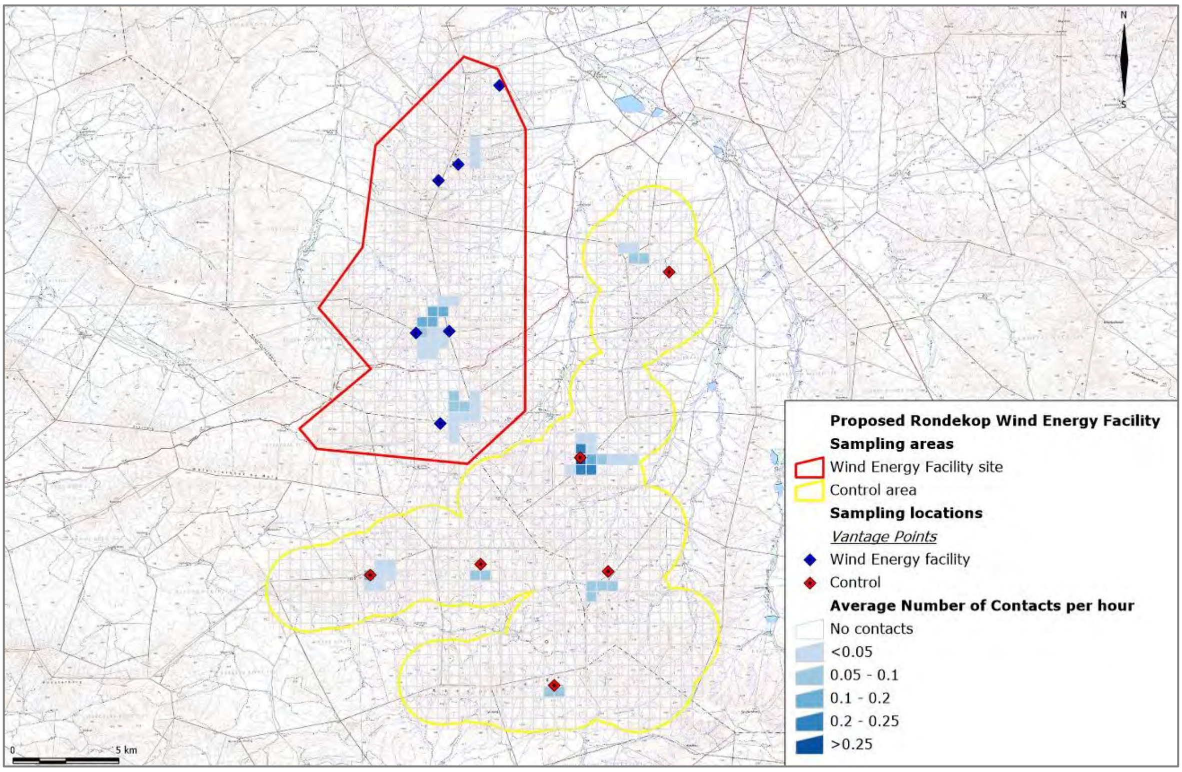

Figure 16 – Average activity of Gliding flights recorded through vantage points for all bird species during the 12-month pre-construction bird monitoring programme.

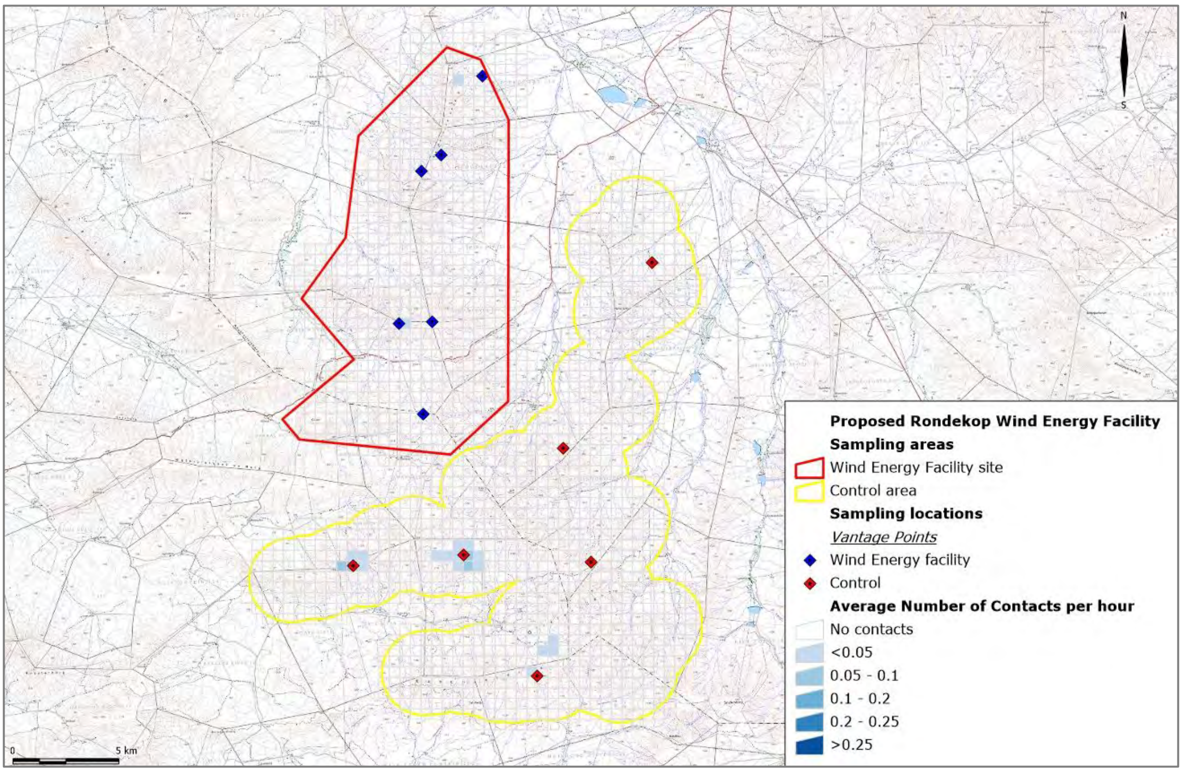

Figure 17 – Average activity of Hunting flights recorded through vantage points for all bird species during the 12-month pre-construction bird monitoring programme.

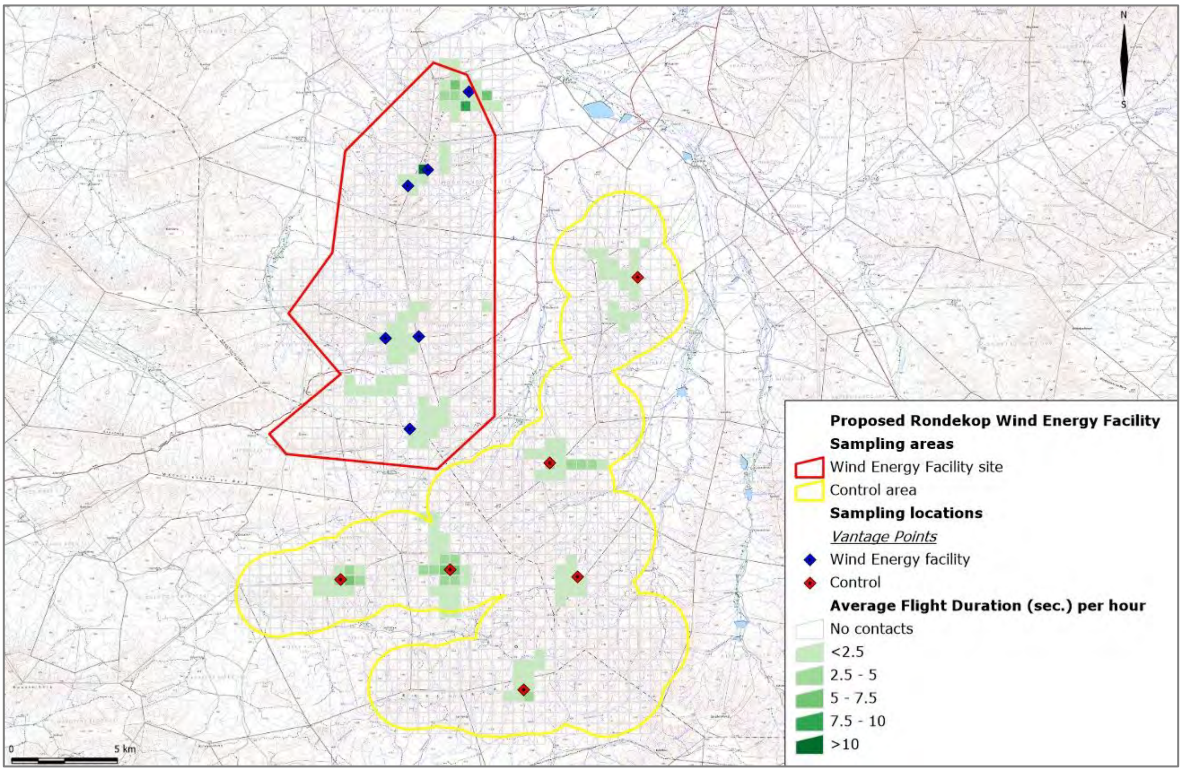

Figure 18 – Distribution of the average time spent recorded through vantage points during the 12-month pre-construction bird monitoring programme.

3.4. Focal sites survey

Waterbodies

As a complement to the previous methodologies, the WEF study site was also searched in order to identify, map and monitor important waterbodies (Figure 20). Ten features of interest to waterbirds and other species were identified, one inside the proposed developmente area, three outside the study area but close to the WEF site and an additional six in the Control area and immediate surroundings. The locations were visited at least twice during the pre-construction monitoring programme, according to Taylor *et al.* (1999).

Most waterbodies visited were considered not important for the sensitive bird community. The waterbodies identified with a higher relevance for the bird community (considering the total data collected) were the WB02 and WB10 (Figure 19). WB02 is located in the north of the Control area and the usage of this site was recorded year round, with the occurrence of sensitive species such as: Greater Flamingo, African Sacred Ibis and Cape Shoveler (Figure 20). Additionally, the WB10 was the location observed with a second highest abundance, especially due to the large numbers of Red-knobbed coot observed in spring. Bird presence was higher especially through winter and spring season, being observed the Cape Shoveler, a sensitive species using the site.

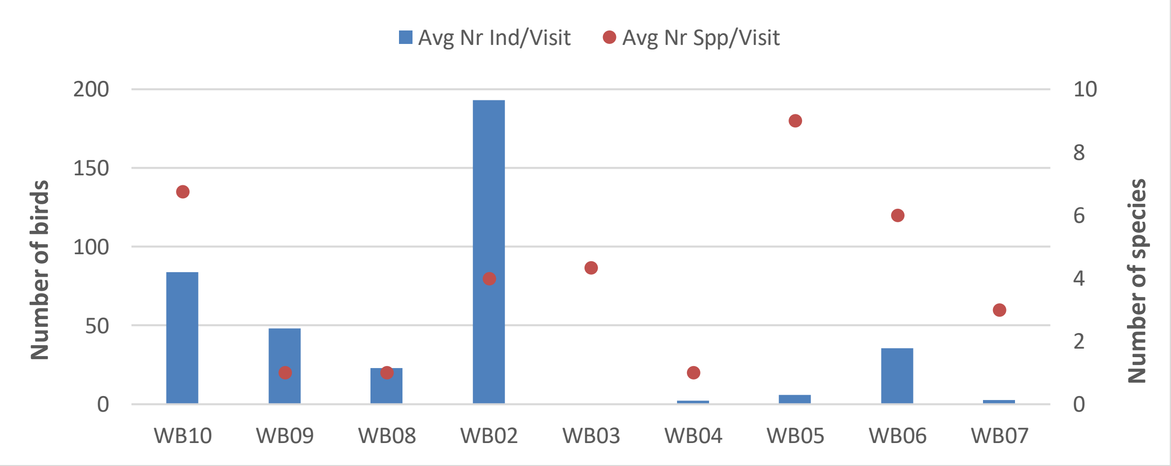

Figure 19 - Average number of birds and the average number of species recorded by visit to each of the waterbodies all located outside of the WEF study area.

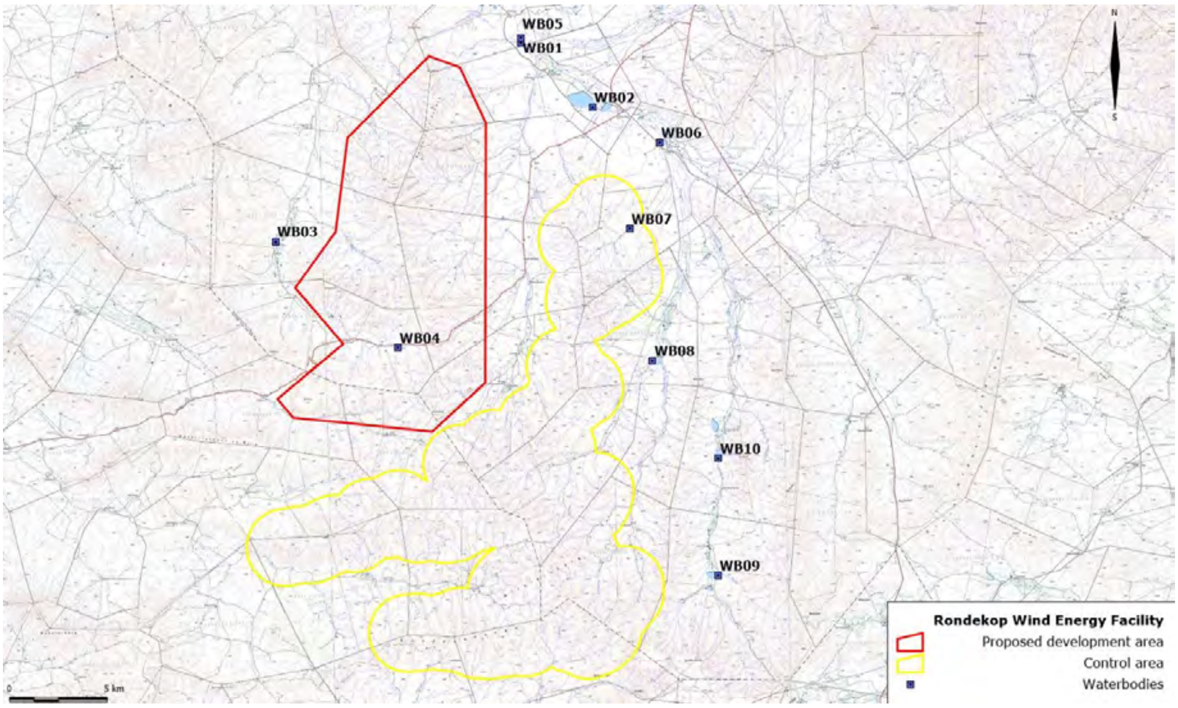

Figure 20 – Distribution of the water features identified and monitored through the bird monitoring programme.

Breeding evidence

Five potential breeding locations were identified during the bird pre-construction monitoring programme, as shown in Figure 21 and Photograph 6. However, none of the nests detected have signs of occupation. NERK01 was not visited during the winter survey, but was visited during the autumn season – with no evidence of breeding observed. It is possible that this location may have been a potential (temporary) feeding location for a Verreaux's Eagle, as a Klipspringer/Steenbok leg was found close to NERK01, with a Verreaux's Eagle being observed perching directly next to the leg. Some whitewash is also prevalent on the rocks in that same area. Regardless, it is not believed that this is an active breeding location at present, although the area does have some potential for it. This location will subsequently not inform the sensitivity of the site, as it is not relevant enough at this point.

During the monitoring programme, nest NECO01 showed no signs of occupation. The local landowner stated that this was a Verreaux's Eagle nest. However, further observations throughout the monitoring campaign revealed that this nest was too exposed to belong to a Verreaux's Eagle. After consultation with other specialists, it was confirmed that this nest is a collapsed Hamerkop nest.

The NECO02 and NECO03 also show no signs of occupation. The NECO04 is a Western Barn Owl roost located in a cliff with the presence of one adult. However, no breeding evidences were confirmed.

Photograph 6 – Examples of potential nesting/breeding/roosting areas in the area. Top left & right from NERK01. Middle left from NECO01. Middle right from NECO02. Bottom left from NECO03. Bottom right from NECO04.

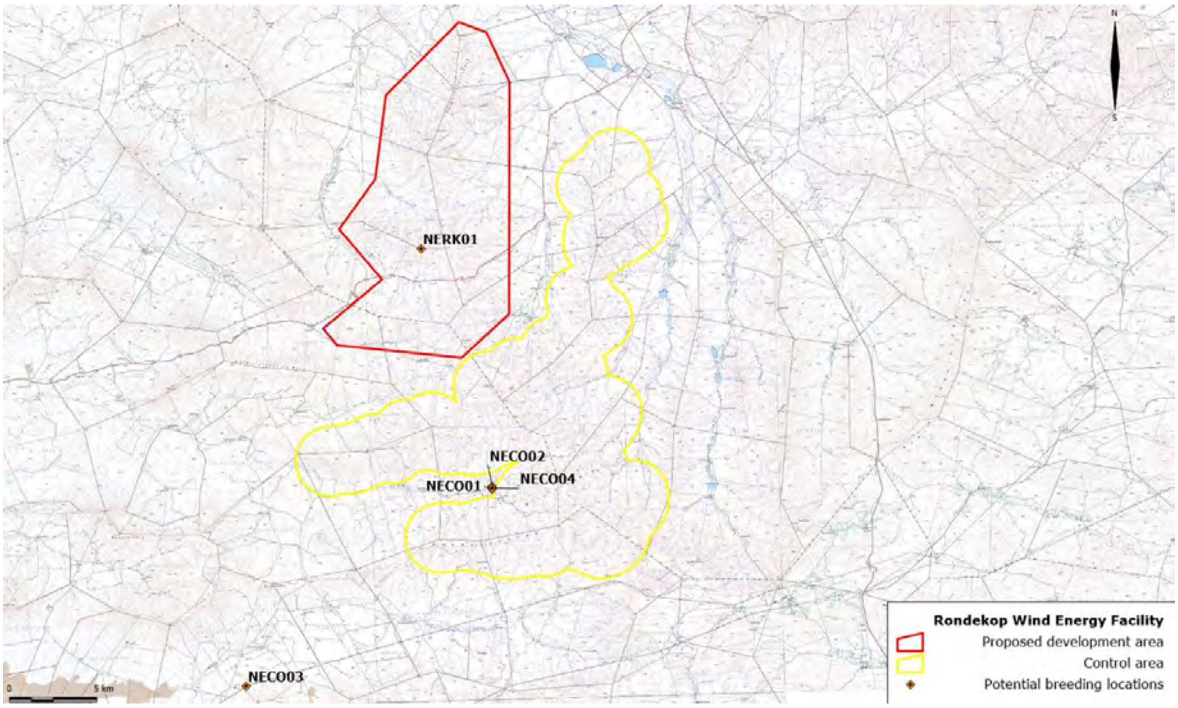

Figure 21 – Potential breeding locations visited during the pre-construction bird monitoring programme at the Rondekop WEF and surrounding area.

3.5. Risk analysis

Risk analysis usually is conducted by taking into consideration the movements observed in the area which could lead to future collisions with wind turbines, both considering proposed turbine placement and technical specifications (such as rotor height). A preliminary analysis presented below provides an indication of the location where sensitive species fly relative to rotor height, taking into consideration one year of observations (Figure 22, Figure 23, Figure 24, Figure 25).

The analysis of the height of flight risk of each species in relation to the underlying biotope revealed that most of the risk movements of sensitive species occurred in hillside/escarpment, ridges, and/or areas of natural vegetation.

In all seasons, there was always observations of some species that fly at rotor height and some exhibit hunting behaviours are also very susceptible to collide with man-made structures, especially *Accipitrids* and *Falcons* (Figure 22, Figure 24).

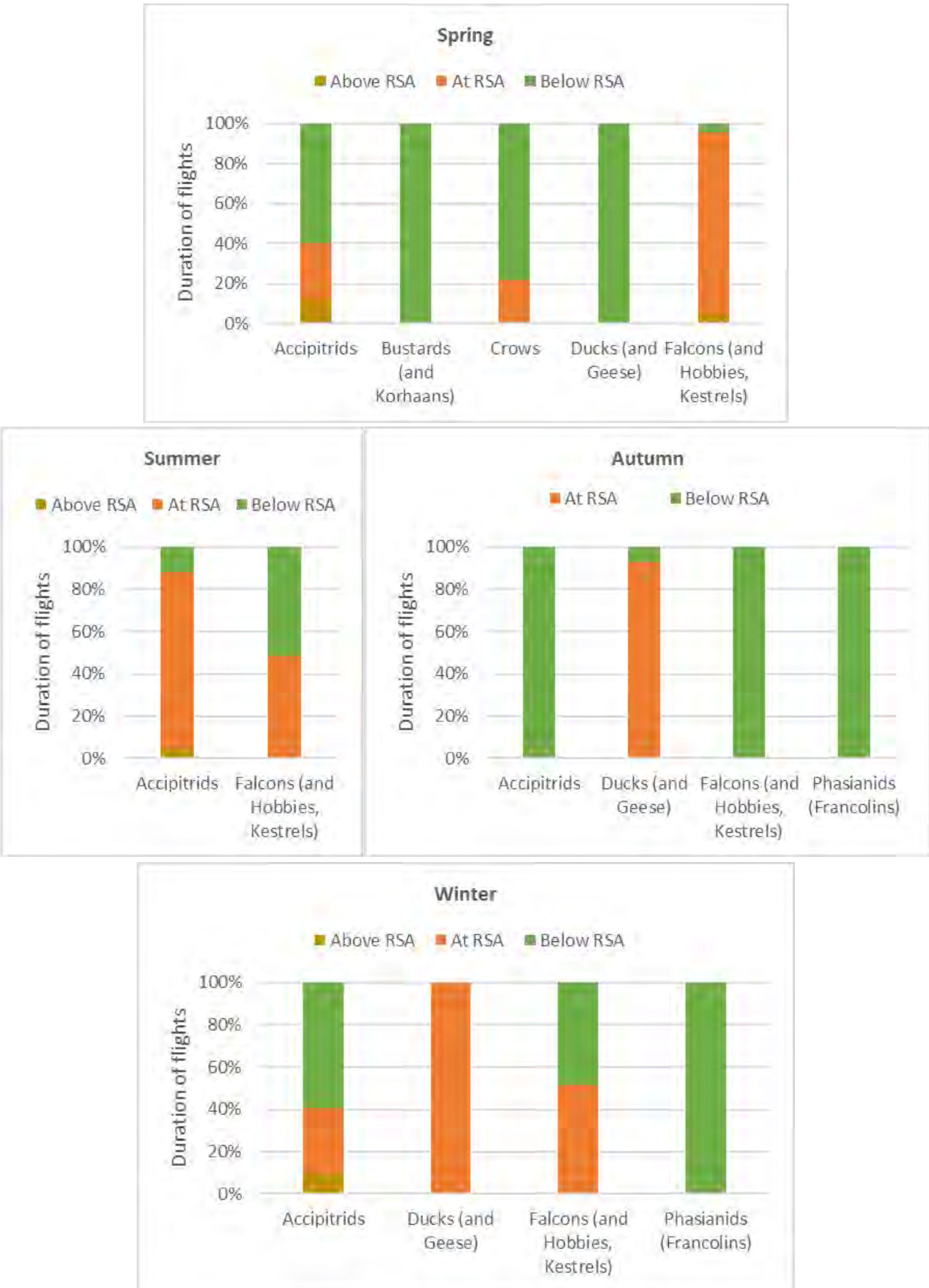

Figure 22 – Duration of flights in relation to RSH per season.

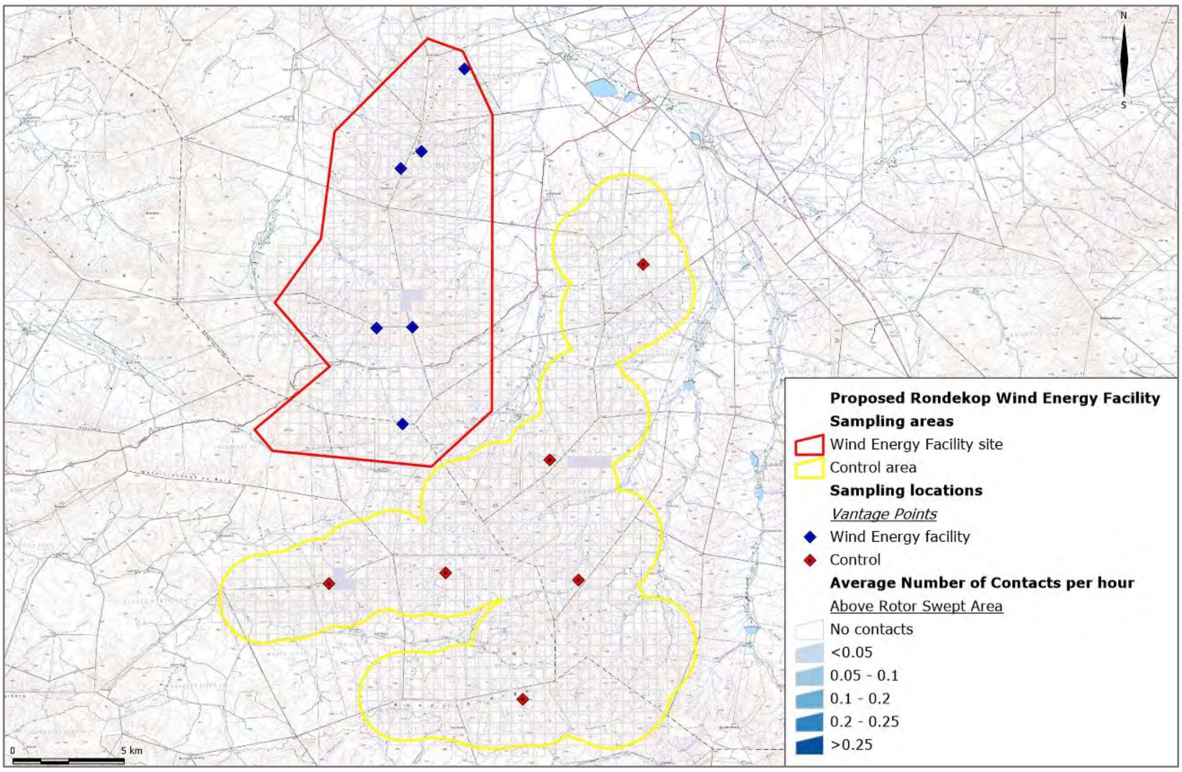

Figure 23 - Average activity of sensitive species recorded above RSA through vantage points during the 12-month pre-construction bird monitoring programme.

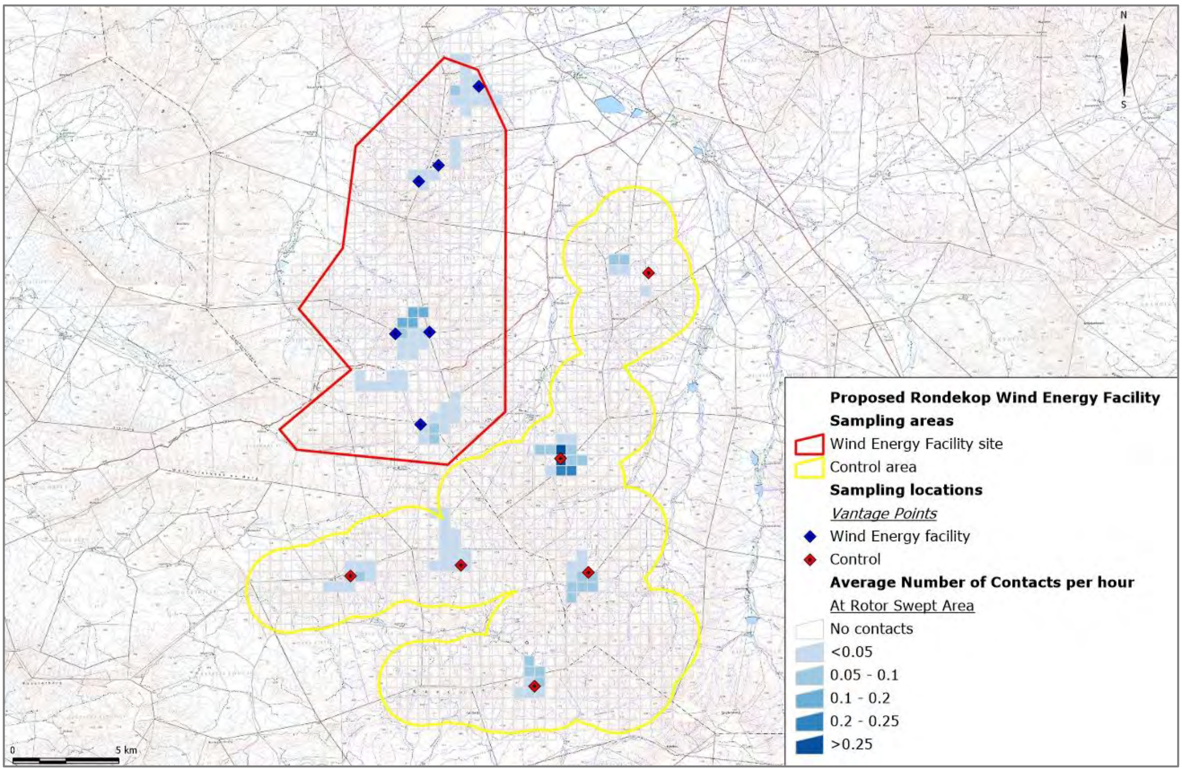

Figure 24 - Average activity of sentive species recorded at RSA through vantage points during the 12-month pre-construction bird monitoring programme.

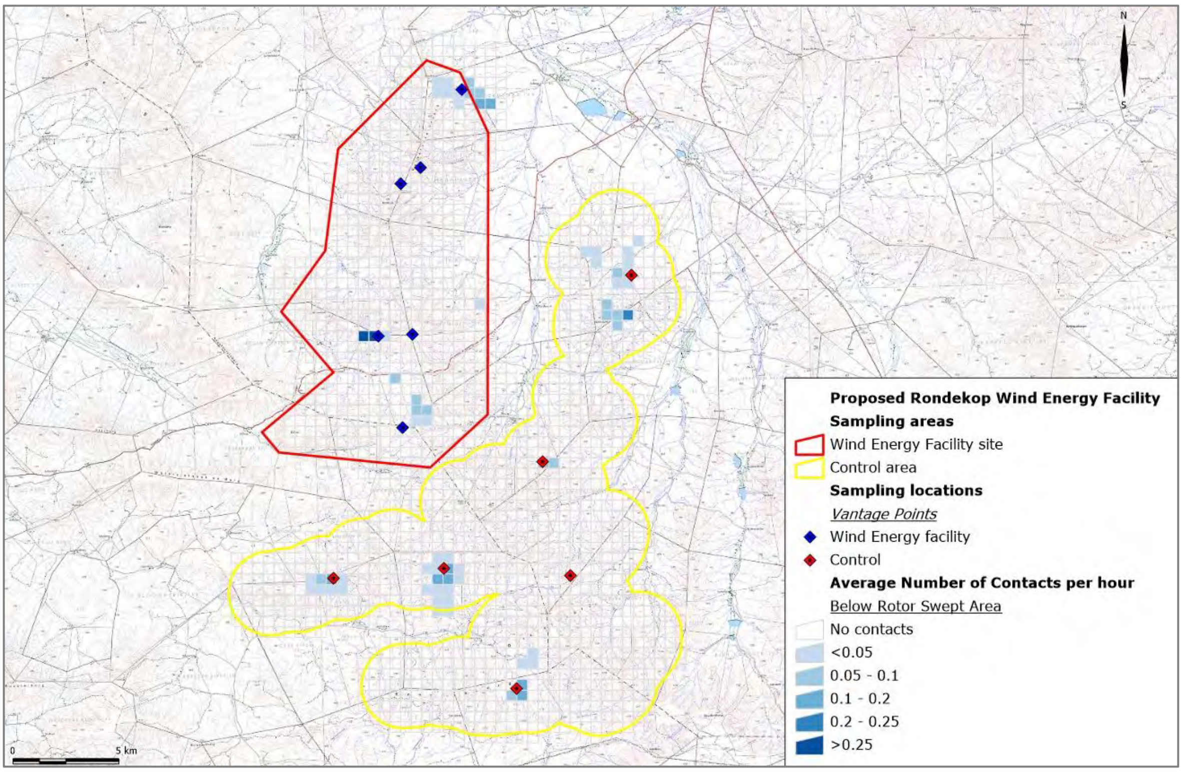

Figure 25 - Average activity of sensitive species recorded below RSA through vantage points during the 12-month pre-construction bird monitoring programme.

3.6. Sensitive areas analysis

Considering the bird community present within the site, some precautions must be followed in order to minimise the potential negative impacts caused by implementation of the Rondekop WEF on the bird community. The presence of sensitive species, as well as the observation of risk behaviours of bird species with known collision with wind turbines, led to the classification of the general area as a medium sensitivity location. In order to safeguard the risk movements identified and thus avoid fatalities caused by the operation of wind turbines, as well as disturbance and/or displacement of sensitive species, the areas presented in Figure 26 were identified to be avoided and/or mitigated from activities associated with wind development:

- Medium sensitivity (Acceptable for turbine placement and associated infrastructure, but with mitigation measures)
    - *Hillside and Ridges:* This type of biotope is frequently used by Accipitrids and Falcons, for soaring and hunting flights, in which a lot of potential collision risk movements (flight at rotor height) are observed.
    - *Natural vegetation:* Within the proposed Rondekop WEF site the area is mostly comprised of natural vegetation. Avifaunal community, especially raptors usually will forage in natural veld, as well as the passerine community use this biotope for nesting and foraging.

- High Sensitivity (No-Go only for turbines and substation):
    - *Riverine thickets*: This type of biotope showed a high importance for passerine species as well as for Raptors and soaring birds. Considering the scarceness and sensitivity of this

vegetation type to land modifications, a 200m protection buffer is considered around the margins of the waterlines with this type of vegetation. No turbine placement or substation placement is allowed to occur within these buffered zones. Although it is preferred that overhead powerlines do not cross these areas, it is more important that any overhead powerlines do not run perpendicular to any known flight paths / migratory routes. Existing roads should be used/upgraded as far as possible, within these areas. Any new roads should cross perpendicular, if new roads cannot be avoided.

- *Water bodies*: As these supply important sources of water, nesting and resting locations for many bird species (not only waterbirds), a 200m protection buffer is considered around any potential margins of water present within the study area.
- *Sensitive routes:* As activity index thresholds are not fully understood or enforced in South Africa, nor presented in the most recent version of the bird monitoring guidelines (Jenkins et al., 2015), it was determined that the best approach would be to follow the activity trends of familiar projects (from sites exhibiting similar characteristics). It was observed from a relatively nearby operational wind farm that high risk flights of priority species (where important fatalities were also noted) were generally orientated in areas where >1 contacts/hour were observed. As such, a grid analysis was conducted to determine the use of geographical space by certain bird species. It was subsequently decided that only sensitive species with >0.25 contacts per hour were to be considered in each 500x500m no-go square. A 200m buffer was then applied around each square to account for potential sensitive flight paths occurring on the inner border of each square.
- 90m *buffer around each turbine:* It is also important to note that no wind turbine may be placed within 90m (longest potential length of a wind turbine blade) of any of the aforementioned sensitive feature buffers. This is relevant in order to prevent the encroachment of wind turbine blades into these sensitive buffer areas when the turbine nacelles are busy rotating.

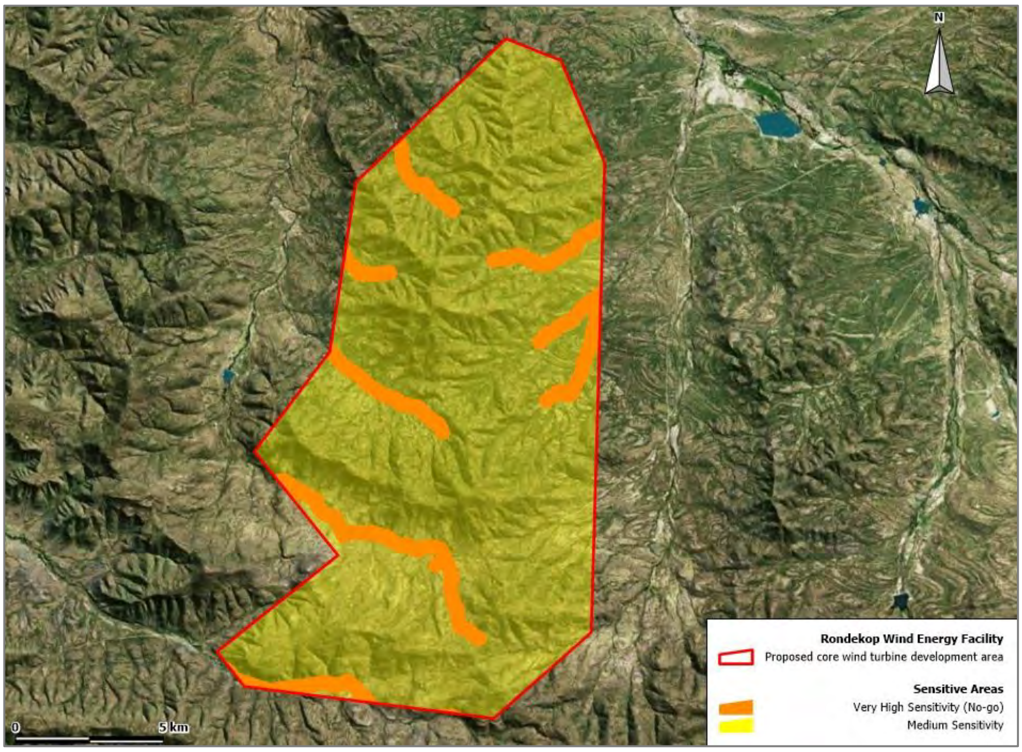

Figure 26 - Sensitive areas for birds identified for the Rondekop WEF during the pre-construction monitoring programme.

4. CONCLUSIONS

This report details the findings of the bird pre-construction monitoring surveys conducted at the proposed Rondekop WEF. The pre-construction bird monitoring programme methodology implemented covered all the relevant seasons for the bird community on the site, as recommended by the *Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa* (Jenkins *et al.* 2015) providing therefore a solid baseline for the establishment of the future assessments (refer to section 2 for details on the methodology implemented, its assumptions and limitations).

The pre-construction bird monitoring programme analysed the study area in order to identify the relevant features for the bird community, as well as the deliniation of the sensitive areas to propose areas for avoidance (no-go areas).

Rondekop WEF **is considered to be located in an area of medium sensitivity with some habitat features of high sensitivity in terms of the bird community** present. It is considered that the impacts can be minimised to the maximum extent possible, mostly through the **avoidance of no-go areas defined, and mitigation measures within areas of medium sensitivity**.

Presently, it is not expected for impacts to be significant, provided that the aforementioned avoidance/mitigation measures are followed. As such, no fatal flaws were identified for this project at this stage. However, this statement is solely based on a monitoring campaign alone, and should be reviewed in the final specialist impact assessment report.

A bird monitoring programme implemented during construction and operational phase will be very important to improve the understanding of the real impact caused by the WEF on local bird populations, as well as validate the success of mitigation strategy proposed.

5. ACKNOWLEDGEMENTS

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7. Appendices

7.1. Appendix I – Figures

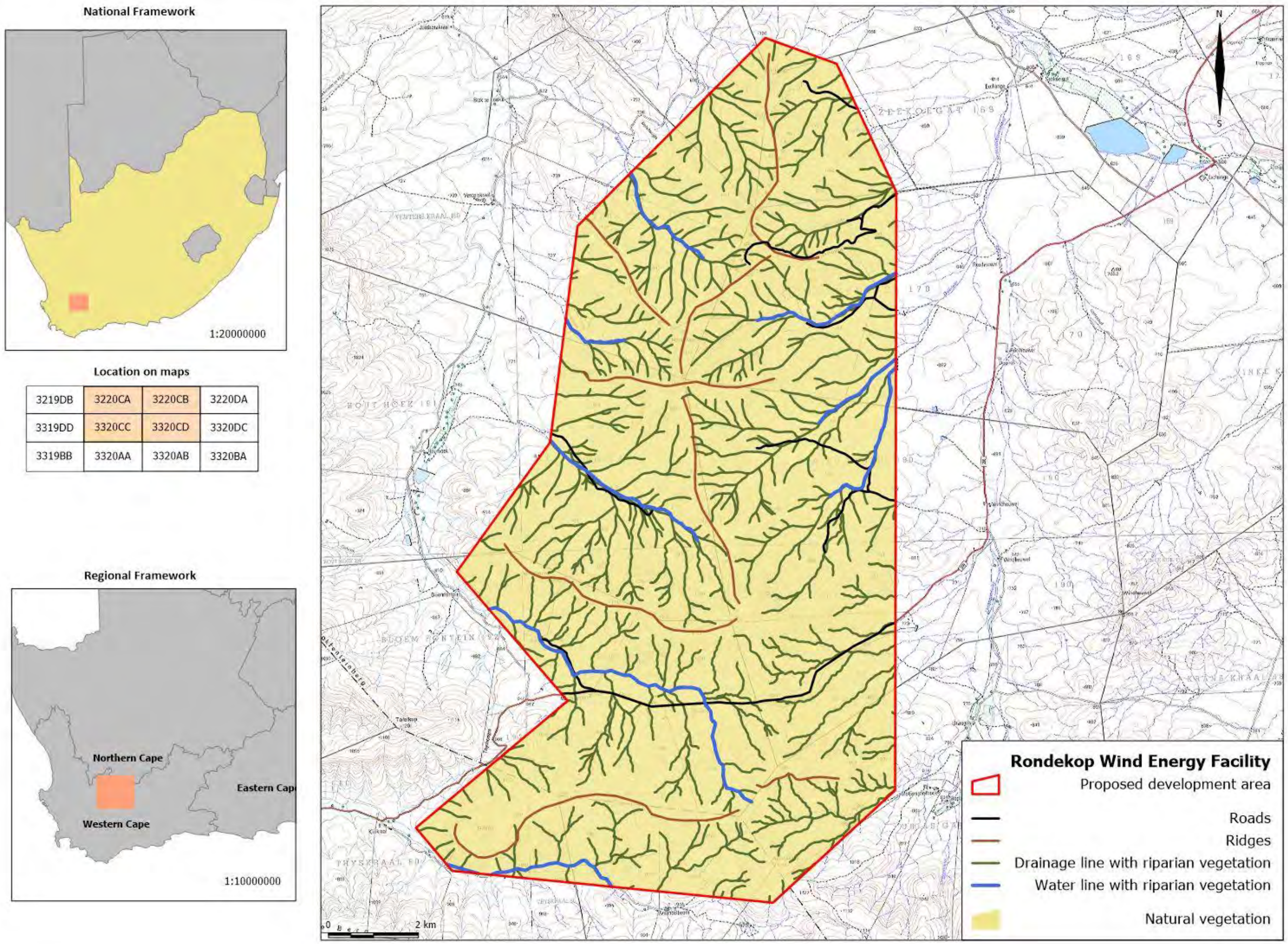


Figure 27 - Location of the proposed Rondekop Wind Energy Facility.

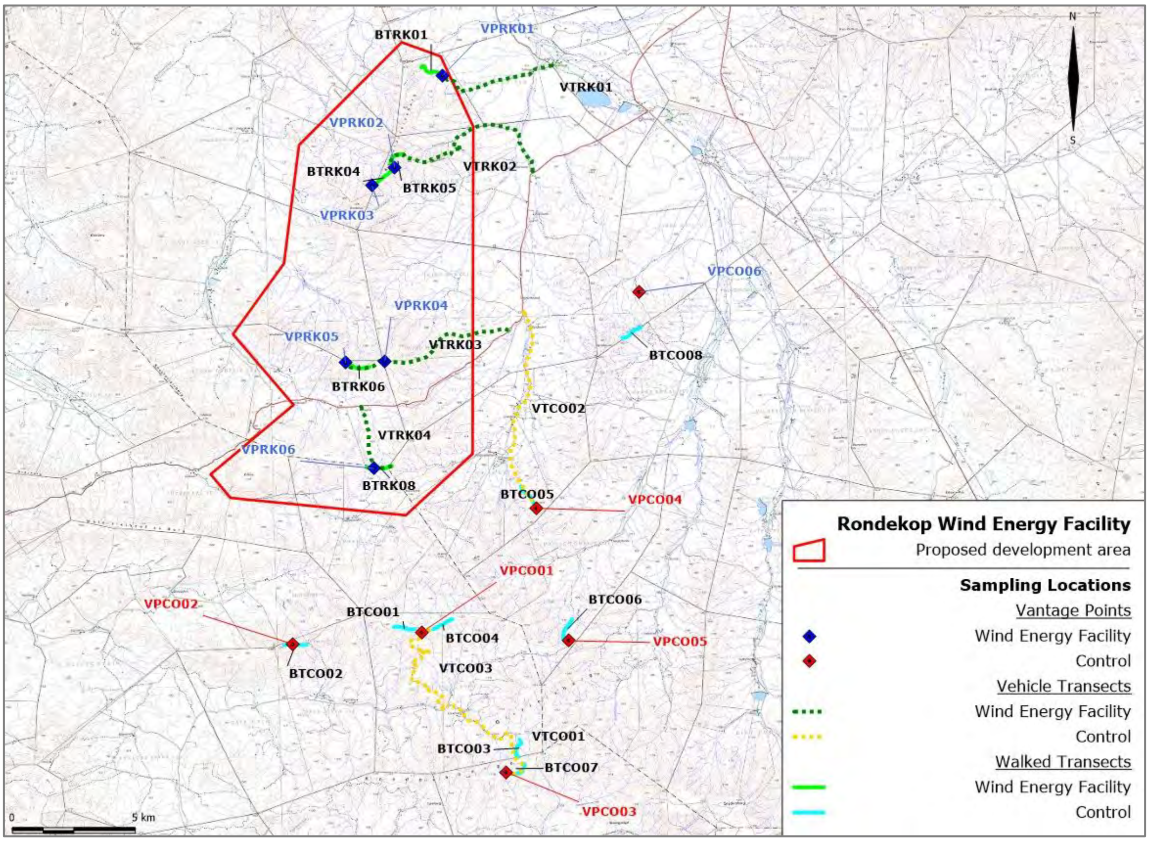


Figure 28 - Sampling locations at Rondekop for the pre-construction bird monitoring programme.

Sampling Locations:

Vantage Points: VPCO01 (32°51'54.88"S | 20°18'45.74"E), **VPCO02** (32°52'5.87"S | 20°15'24.70"E), **VPCO03** (32°55'3.08"S | 20°20'52.82"E), **VPCO04** (32°49'14.44"S | 20°21'50.58"E), **VPCO05** (32°52'11.11"S | 20°22'35.50"E), **VPCO06** (32°44'31.68"S | 20°24'40.24"E), **VPRK01** (32°39'38.36"S | 20°19'41.82"E), **VPRK02** (32°41'37.94"S | 20°18'23.34"E), **VPRK03** (32°42'1.46"S | 20°17'47.37"E), **VPRK04** (32°45'54.07"S | 20°18'0.09"E), **VPRK05** (32°45'54.96"S| 20°16'58.57"E), **VPRK06** (32°48'16.01"S | 20°17'38.69"E).

Walked Transects (Central Points): BTCO01 (32°51'48.02"S | 20°18'19.85"E), **BTCO02** (32°52'6.15"S | 20°15'28.76"E), **BTCO03** (32°54'31.21"S | 20°21'10.24"E), **BTCO04** (32°51'44.58"S | 20°19'20.09"E), **BTCO05** (32°48'55.98"S | 20°21'37.23"E), **BTCO06** (32°51'53.83"S | 20°22'31.77"E), **BTCO07** (32°55'4.36"S | 20°21'13.31"E), **BTCO08** (32°45'24.28"S | 20°24'26.95"E), **BTRK01** (32°39'33.89"S | 20°19'23.52"E), **BTRK04** (32°41'50.60"S | 20°18'5.33"E), **BTRK05** (32°41'26.55"S | 20°18'19.15"E), **BTRK06** (32°46'2.65"S | 20°17'17.91"E), **BTRK08** (32°48'15.60"S | 20°17'46.87"E).

7.2. Appendix II - List of potential and occurring species at the site

Species of birds identified in the study area by all the methodologies implemented for the monitoring programme. Phenology (IUCN 2016)**: R – Resident; BM – Breeding migrant; NBM – Non breeding migrant. RLCS - IUCN Red List of Threatened Species Conservation Status** (IUCN 2016) **and SA RLCS - South Africa Red List Conservation Status** (Taylor, Peacock & Wanless 2015)**: VU – Vulnerable, NT – Nearly Threatened, LC - Least concern; na – not evaluated; Population Trend** (IUCN 2016)**. Endemism** (BLSA 2016)**: * – Endemic. (*) – Nearly Endemic. SLS - endemic to South Africa, Lesotho and Swaziland; BSLS – breeding endemic to South Africa, Lesotho and Swaziland. WEF – the species was detected within the proposed WEF area; CO – the species was detected in the surrounding area. Scoping phase** (Bioinsight 2016a)**.**

Order	Full Name	Scientific Name	Phenology	RLCS	SA RLCS	CMS	Population Trend	Abundance	Endemic SA	Sensitive sp.	Scoping phase	WEF	CO
PASSERIFORMES	African Reed Warbler	*Acrocephalus baeticatus*	BM	NA	-		NA	Fairly common	-	-	X	-	-
CHARADRIIFORMES	Common Sandpiper	*Actitis hypoleucos*	NBM	LC	-	II	Decreasing	Common	-	-	X	-	-
ANSERIFORMES	Egyptian Goose	*Alopochen aegyptiaca*	R	LC	-	II	Decreasing	Common to abundant	-	-	X	X	X
ANSERIFORMES	Cape Teal	*Anas capensis*	R	LC	-	II	Increasing	Uncommon to locally abundant	-	-	X	X	-
ANSERIFORMES	Red-billed Teal	*Anas erythrorhyncha*	R	LC	-	II	Decreasing	Very common	-	-	X	X	X
ANSERIFORMES	Cape Shoveler	*Anas smithii*	R	LC	-	II	Increasing	Rare to locally abundant	-	X	X	X	X
ANSERIFORMES	African Black Duck	*Anas sparsa*	R	LC	-	II	Decreasing	Fairly common	-	-	X	-	-
ANSERIFORMES	Yellow-billed Duck	*Anas undulata*	R	LC	-	II	Stable	Common	-	-	X	X	X
PASSERIFORMES	Cape Penduline-Tit	*Anthoscopus minutus*	R	LC	-		Stable	Common	-	-	X	-	-
PASSERIFORMES	African Pipit	*Anthus cinnamomeus*	R	NA	-		NA	Common	-	-	X	-	-
PASSERIFORMES	Long-billed Pipit	*Anthus similis*	R	LC	-		Stable	Fairly common	-	-	X	-	-
APODIFORMES	Little Swift	*Apus affinis*	R	LC	-		Increasing	Common	-	-	X	-	-
APODIFORMES	Common Swift	*Apus apus*	NBM	LC	-		Decreasing	Unknown	-	X	X	-	-
APODIFORMES	White-rumped Swift	*Apus caffer*	BM	LC	-		Increasing	Very common	-	-	X	-	X
ACCIPITRIFORMES	Verreauxs' Eagle	*Aquila verreauxii*	R	LC	VU	II	Stable	Locally fairly common	-	X	X	X	X
PELECANIFORMES	Grey Heron	*Ardea cinerea*	R	LC	-		Unknown	Locally common	-	-	X	X	-
PELECANIFORMES	Black-headed Heron	*Ardea melanocephala*	R	LC	-		Increasing	Common	-	-	X	-	-
PASSERIFORMES	Pririt Batis	*Batis pririt*	R	LC	-		Stable	Common	-	-	X	-	-

Order	Full Name	Scientific Name	Phenology	RLCS	SA RLCS	CMS	Population Trend	Abundance	Endemic SA	Sensitive sp.	Scoping phase	WEF	CO
PELECANIFORMES	Hadeda Ibis	*Bostrychia hagedash*	R	LC	-		Increasing	Common	-	-	X	-	X
STRIGIFORMES	Spotted Eagle-Owl	*Bubo africanus*	R	LC	-		Stable	Generally common	-	X	X	-	-
PELECANIFORMES	Western Cattle Egret	*Bubulcus ibis*	R	LC	-		Increasing	Very common	-	-	X	-	-
ACCIPITRIFORMES	Jackal Buzzard	*Buteo rufofuscus*	R	LC	-	II	Stable	Fairly common	(*)	X	X	X	X
PASSERIFORMES	Red-capped Lark	*Calandrella cinerea*	R	LC	-		Increasing	Common to locally abundant	-	-	X	-	-
PASSERIFORMES	Karoo Lark	*Calendulauda albescens*	R	LC	-		Decreasing	Common to fairly common	(*)	X	X	X	X
CHARADRIIFORMES	Little Stint	*Calidris minuta*	NBM	LC	-	II	Decreasing	Common	-	-	X	-	-
PASSERIFORMES	Greater Striped Swallow	*Cecropis cucullata*	BM	LC	-		Increasing	Locally common	-	-	X	-	-
PASSERIFORMES	Familiar Chat	*Cercomela familiaris*	R	LC	-	II	Stable	Common	-	-	X	-	X
PASSERIFORMES	Karoo Chat	*Cercomela schlegelii*	R	LC	-	II	Stable	Common	-	-	X	X	X
PASSERIFORMES	Sickle-winged Chat	*Cercomela sinuata*	R	LC	-	II	Stable	Uncommon to locally common	(*)	-	X	-	-
PASSERIFORMES	Tractrac Chat	*Cercomela tractrac*	R	LC	-	II	Stable	Fairly common	-	-	X	-	-
PASSERIFORMES	Karoo Long-billed Lark	*Certhilauda subcoronata*	R	LC	-		Stable	Common	-	-	X	X	X
CHARADRIIFORMES	Kittlitz's Plover	*Charadrius pecuarius*	R	LC	-	II	Unknown	Locally common	-	-	X	X	-
CHARADRIIFORMES	Three-banded Plover	*Charadrius tricollaris*	R	LC	-	II	Unknown	Common	-	-	X	X	-
PASSERIFORMES	Spike-heeled Lark	*Chersomanes albofasciata*	R	LC	-		Decreasing	Fairly common to common	-	-	X	-	X
CHARADRIIFORMES	White-winged Tern	*Chlidonias leucopterus*	NBM	LC	-	II	Stable	Common	-	-	X	-	-
CICONIIFORMES	Black Stork	*Ciconia nigra*	-	LC	VU	II	Unknown	Uncommon	-	X	X	-	X
PASSERIFORMES	Greater Double-collared Sunbird	*Cinnyris afer*	R	LC	-		Stable	Locally common	SLS	-	-	-	X
PASSERIFORMES	Southern Double-collared Sunbird	*Cinnyris chalybeus*	R	LC	-		Stable	Common	(*)	-	X	X	X
PASSERIFORMES	Dusky Sunbird	*Cinnyris fuscus*	R	LC	-		Stable	Locally common	-	-	X	-	-
PASSERIFORMES	Marico Sunbird	*Cinnyris mariquensis*	R	LC	-		Stable	Locally common	-	-	-	X	-
ACCIPITRIFORMES	Black-chested Snake Eagle	*Circaetus pectoralis*	R	LC	-	II	Unknown	Uncommon to locally common	-	X	X	-	X
ACCIPITRIFORMES	Black Harrier	*Circus maurus*	R	VU	EN	II	Stable	Uncommon	(*)	X	X	X	X

Order	Full Name	Scientific Name	Phenology	RLCS	SA RLCS	CMS	Population Trend	Abundance	Endemic SA	Sensitive sp.	Scoping phase	WEF	CO
PASSERIFORMES	Neddicky	*Cisticola fulvicapilla*	R	LC	-		Stable	Locally common	-	-	-	-	X
PASSERIFORMES	Grey-backed Cisticola	*Cisticola subruficapilla*	R	LC	-		Decreasing	Locally common to very common	-	-	X	X	X
COLIIFORMES	White-backed Mousebird	*Colius colius*	R	LC	-		Increasing	Locally common	-	-	X	-	-
COLUMBIFORMES	Speckled Pigeon	*Columba guinea*	R	LC	-		Stable	Common	-	-	X	-	X
COLUMBIFORMES	Rock Dove	*Columba livia*	R	LC	-		Decreasing	Abundant to uncommon	-	-	X	-	-
PASSERIFORMES	White-necked Raven	*Corvus albicollis*	R	LC	-		Decreasing	Locally common	-	-	X	X	X
PASSERIFORMES	Pied crow	*Corvus albus*	R	LC	-		Stable	Common to abundant	-	-	X	X	X
PASSERIFORMES	Cape Crow	*Corvus capensis*	R	LC	-		Increasing	Common	-	-	-	-	X
PASSERIFORMES	Cape Robin-Chat	*Cossypha caffra*	R	LC	-	II	Stable	Common	-	-	X	-	-
PASSERIFORMES	White-throated Canary	*Crithagra albogularis*	R	LC	-		Stable	Locally common	-	-	X	-	-
PASSERIFORMES	Yellow Canary	*Crithagra flaviventris*	R	LC	-		Stable	Common	-	-	X	X	X
PASSERIFORMES	Cape Bunting	*Emberiza capensis*	R	LC	-		Stable	Fairly common to common	-	-	X	X	X
PASSERIFORMES	Lark-like Bunting	*Emberiza impetuani*	R	LC	-		Stable	Common to very common	-	-	X	X	X
PASSERIFORMES	Karoo Eremomela	*Eremomela gregalis*	R	LC	-		Decreasing	Fairly common	(*)	-	X	-	X
PASSERIFORMES	Yellow-bellied Eremomela	*Eremomela icteropygialis*	R	LC	-		Stable	Fairly common	-	-	X	-	-
PASSERIFORMES	Karoo Scrub Robin	*Erythropygia coryphoeus*	R	LC	-	II	Stable	Common	-	-	X	X	X
PASSERIFORMES	Common Waxbill	*Estrilda astrild*	R	LC	-		Stable	Common	-	-	X	-	-
OTIDIFORMES	Karoo Korhaan	*Eupodotis vigorsii*	R	LC	NT		Increasing	Uncommon to common	-	X	X	-	-
PASSERIFORMES	Cinnamon-breasted Warbler	*Euryptila subcinnamomea*	R	LC	-		Stable	Locally fairly common	(*)	-	X	-	-
FALCONIFORMES	Greater Kestrel	*Falco rupicoloides*	R	LC	-	II	Stable	Fairly common	-	X	X	-	-
FALCONIFORMES	Rock Kestrel	*Falco rupicolus*	R	NA	-	II	NA	Common to uncommon	-	X	X	X	X
GRUIFORMES	Red-knobbed coot	*Fulica cristata*	R	LC	-		Decreasing	Common	-	-	X	X	X
PASSERIFORMES	Large-billed Lark	*Galerida magnirostris*	R	LC	-		Increasing	Fairly common to common	(*)	X	X	X	X
CHARADRIIFORMES	African Snipe	*Gallinago nigripennis*	R	LC	-	II	Unknown	Uncommon to locally common	-	X	X	-	-

Order	Full Name	Scientific Name	Phenology	RLCS	SA RLCS	CMS	Population Trend	Abundance	Endemic SA	Sensitive sp.	Scoping phase	WEF	CO
PICIFORMES	Ground Woodpecker	*Geocolaptes olivaceus*	R	LC	-		Stable	Locally Common	SLS	-	X	-	-
ACCIPITRIFORMES	Booted Eagle	*Hieraaetus pennatus*	R	LC	-	II	Decreasing	Locally fairly common	-	X	X	-	-
CHARADRIIFORMES	Black-winged Stilt	*Himantopus himantopus*	R	LC	-	II	Increasing	Common	-	-	X	X	X
PASSERIFORMES	White-throated Swallow	*Hirundo albigularis*	BM	LC	-		Increasing	Locally common	-	-	X	-	-
PASSERIFORMES	Rock Martin	*Hirundo fuligula*	R	LC	-		Stable	Common	-	-	X	-	-
PASSERIFORMES	Barn Swallow	*Hirundo rustica*	NBM	LC	-		Decreasing	Common to abundant	-	-	X	-	-
PASSERIFORMES	Pied Starling	*Lamprotornis bicolor*	R	LC	-		Stable	Locally common to abundant	SLS	-	X	-	-
PASSERIFORMES	Southern (Common) Fiscal	*Lanius collaris*	R	LC	-		Increasing	Generally common	-	-	X	-	-
PASSERIFORMES	Rufous-eared Warbler	*Malcorus pectoralis*	R	LC	-		Stable	Common	-	-	X	X	X
ACCIPITRIFORMES	Pale Chanting Goshawk	*Melierax canorus*	R	LC	-	II	Stable	Rare to locally common	-	X	X	X	X
CORACIIFORMES	European Bee-eater	*Merops apiaster*	NBM	LC	-	II	Decreasing	Common	-	-	X	-	-
PASSERIFORMES	Cape Clapper Lark	*Mirafra apiata*	R	LC	-		Decreasing	Fairly common to common	(*)	X	X	-	X
PASSERIFORMES	Cape Wagtail	*Motacilla capensis*	R	LC	-		Stable	Common	-	-	X	-	-
PASSERIFORMES	Ant-eating Chat	*Myrmecocichla formicivora*	R	LC	-	II	Stable	Common	-	-	X	-	-
PASSERIFORMES	Malachite Sunbird	*Nectarinia famosa*	R	LC	-		Stable	Common to locally abundant	-	-	X	-	-
OTIDIFORMES	Ludwig's Bustard	*Neotis ludwigii*	R	EN	EN		Decreasing	Sparse to locally common	-	X	X	-	X
ANSERIFORMES	Southern Pochard	*Netta erythrophthalma*	R	LC	-	II	Decreasing	Common	-	-	X	-	-
PELECANIFORMES	Black-crowned Night Heron	*Nycticorax nycticorax*	R	LC	-		Decreasing	Common	-	-	-	X	-
COLUMBIFORMES	Namaqua Dove	*Oena capensis*	R	LC	-		Increasing	Fairly common to comon	-	-	X	-	-
PASSERIFORMES	Mountain Wheatear	*Oenanthe monticola*	R	LC	-	II	Stable	Locally common	-	-	X	X	X
PASSERIFORMES	Northern Wheatear	*Oenanthe oenanthe*	Rare or Vagrant	LC	-	II	Decreasing	Rare	-	-	-	X	-
PASSERIFORMES	Pale-winged Starling	*Onychognathus nabouroup*	R	LC	-		Stable	Common	-	-	X	-	-
ANSERIFORMES	Maccoa Duck	*Oxyura maccoa*	R	NT	NT	II	Decreasing	Common	-	X	X	-	-
PASSERIFORMES	Grey Tit	*Parus afer*	R	LC	-		Stable	Fairly common	(*)	-	X	X	X

Order	Full Name	Scientific Name	Phenology	RLCS	SA RLCS	CMS	Population Trend	Abundance	Endemic SA	Sensitive sp.	Scoping phase	WEF	CO
PASSERIFORMES	House Sparrow	*Passer domesticus*	R	LC	-		Decreasing	Locally common	-	-	X	-	-
PASSERIFORMES	Cape Sparrow	*Passer melanurus*	R	LC	-		Stable	Common to very common	-	-	X	-	X
SULIFORMES	Reed Cormorant	*Phalacrocorax africanus*	R	NA	-		Decreasing	Common	-	-	X	-	-
SULIFORMES	White-breasted Cormorant	*Phalacrocorax lucidus*	R	LC	-		Increasing	Common	-	-	X	-	-
PHOENICOPTERIFORMES	Greater Flamingo	*Phoenicopterus roseus*	R	LC	NT	II	Increasing	Locally abundant	-	X	X	X	-
PASSERIFORMES	Namaqua Warbler	*Phragmacia substriata*	R	LC	-		Increasing	Common	(*)	-	X	-	-
PELECANIFORMES	African Spoonbill	*Platalea alba*	R	LC	-	II	Stable	Locally common	-	-	X	-	X
ANSERIFORMES	Spur-winged Goose	*Plectropterus gambensis*	R	LC	-	II	Increasing	Locally common to very common	-	-	X	X	-
PELECANIFORMES	Glossy Ibis	*Plegadis falcinellus*	R	LC	-	II	Decreasing	Locally common	-	-	X	-	-
PASSERIFORMES	Cape Weaver	*Ploceus capensis*	R	LC	-		Stable	Common	(*)	-	X	-	-
PASSERIFORMES	Southern Masked Weaver	*Ploceus velatus*	R	LC	-		Stable	Common	-	-	X	-	-
PODICIPEDIFORMES	Great Crested Grebe	*Podiceps cristatus*	R	LC	-		Unknown	Locally common	-	-	X	-	-
PODICIPEDIFORMES	Black-necked Grebe	*Podiceps nigricollis*	R	LC	-		Unknown	Uncommon to locally common	-	-	X	X	X
ACCIPITRIFORMES	Martial Eagle	*Polemaetus bellicosus*	R	VU	EN	II	Decreasing	Uncommon	-	X	X	X	X
ACCIPITRIFORMES	African Harrier-Hawk	*Polyboroides typus*	R	LC	-	II	Stable	Locally common	-	X	X	-	X
PASSERIFORMES	Karoo Prinia	*Prinia maculosa*	R	LC	-		Decreasing	Common to locally very common	(*)	-	X	X	X
GALLIFORMES	Cape Spurfowl	*Pternistis capensis*	R	LC	-		NA	Common to locally abundant	(*)	-	X	-	-
PTEROCLIFORMES	Namaqua Sandgrouse	*Pterocles namaqua*	R	LC	-		Stable	Common	-	-	X	-	X
PASSERIFORMES	Cape Bulbul	*Pycnonotus capensis*	R	LC	-		Stable	Common to very common	*	-	X	-	X
CHARADRIIFORMES	Pied Avocet	*Recurvirostra avosetta*	R	LC	-	II	Unknown	Locally common	-	-	X	X	-
PASSERIFORMES	Brown-throated Martin	*Riparia paludicola*	R	LC	-		Decreasing	Locally common	-	-	X	-	-
GALLIFORMES	Grey-winged Francolin	*Scleroptila africana*	R	LC	-		Stable	Common	SLS	X	X	X	X
PELECANIFORMES	Hamerkop	*Scopus umbretta*	R	LC	-		Stable	Locally common	-	X	X	-	X

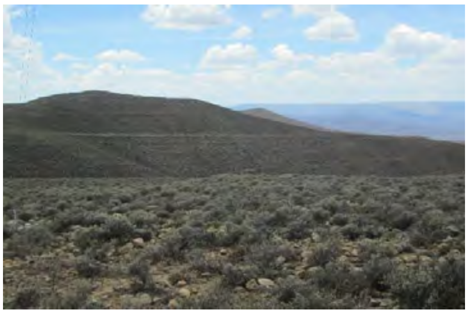
Order	Full Name	Scientific Name	Phenology	RLCS	SA RLCS	CMS	Population Trend	Abundance	Endemic SA	Sensitive sp.	Scoping phase	WEF	CO
PASSERIFORMES	Black-headed Canary	*Serinus alario*	R	LC	-		Stable	Locally common	(*)	-	X	-	X
PASSERIFORMES	Cape Canary	*Serinus canicollis*	R	LC	-		Stable	Locally common	-	-	X	-	-
PASSERIFORMES	Fiscal Flycatcher	*Sigelus silens*	R	LC	-	II	Stable	Common	(*)	-	X	-	-
PASSERIFORMES	Fairy Flycatcher	*Stenostira scita*	R	LC	-		Stable	Locally common to abundant	(*)	-	X	-	-
COLUMBIFORMES	Cape Turtle Dove	*Streptopelia capicola*	R	LC	-		Increasing	Common to fairly common	-	-	X	-	X
COLUMBIFORMES	Red-eyed Dove	*Streptopelia semitorquata*	R	LC	-		Increasing	Fairly common to common	-	-	X	-	-
COLUMBIFORMES	Laughing Dove	*Streptopelia senegalensis*	R	LC	-		Stable	Common	-	-	X	-	-
PASSERIFORMES	Common Starling	*Sturnus vulgaris*	R	LC	-		Unknown	Common	-	-	X	-	-
PASSERIFORMES	Layard's Tit-Babbler	*Sylvia layardi*	R	LC	-		Stable	Common	(*)	-	X	-	-
PASSERIFORMES	Chestnut-vented Tit-Babbler	*Sylvia subcaerulea*	R	LC	-		Stable	Common	-	-	X	-	-
PASSERIFORMES	Long-billed crombec	*Sylvietta rufescens*	R	LC	-		Stable	Common	-	-	X	-	-
PODICIPEDIFORMES	Little Grebe	*Tachybaptus ruficollis*	R	LC	-		Decreasing	Common to locally abundant	-	-	X	-	X
APODIFORMES	Alpine Swift	*Tachymarptis melba*	BM	LC	-		Stable	Generally common	-	-	X	-	-
ANSERIFORMES	South African Shelduck	*Tadorna cana*	R	LC	-	II	Increasing	Common	-	-	X	X	X
PASSERIFORMES	Bokmakierie	*Telophorus zeylonus*	R	LC	-		Stable	Common	-	-	X	X	X
PELECANIFORMES	African Sacred Ibis	*Threskiornis aethiopicus*	R	LC	-	II (subsp. aethiopicus)	Decreasing	Common	-	X	X	X	-
PICIFORMES	Acacia Pied Barbet	*Tricholaema leucomelas*	R	LC	-		Increasing	Fairly common	-	-	X	-	-
CHARADRIIFORMES	Common Greenshank	*Tringa nebularia*	0	LC	-	II	Stable	0	-	-	X	-	-
PASSERIFORMES	Karoo Thrush	*Turdus smithi*	0	NA	-		NA	0	(*)	-	X	-	-
STRIGIFORMES	Western Barn Owl	*Tyto alba*	R	LC	-		Stable	Generally common	-	-	-	-	X
BUCEROTIFORMES	African Hoopoe	*Upupa africana*	R	NA	-		NA	Fairly common	-	-	X	-	-
COLIIFORMES	Red-faced Mousebird	*Urocolius indicus*	R	LC	-		Unknown	Locally common	-	-	X	-	-
CHARADRIIFORMES	Blacksmith Lapwing	*Vanellus armatus*	R	LC	-	II	Increasing	Common	-	-	X	X	X
CHARADRIIFORMES	Crowned Lapwing	*Vanellus coronatus*	R	LC	-	II	Increasing	Common	-	-	X	-	-

Order	Full Name	Scientific Name	Phenology	RLCS	SA RLCS	CMS	Population Trend	Abundance	Endemic SA	Sensitive sp.	Scoping phase	WEF	CO
PASSERIFORMES	Cape White-eye	*Zosterops capensis*	R	NA	-		Unknown	Common to very common	(*)	-	X	-	-

7.3. Appendix III – Sampling locations characterisation

<table>
<tr><th>Sampling type</th><th>Area</th><th>Sampling point</th><th>Characterisation</th><th>Photo</th></tr>
<tr><td rowspan="4">Vantage Points</td><td rowspan="4">Rondekop WEF</td><td>VPRK01</td><td>Biotope: Scrub
Vegetation: Koedoesberge-Moordenaars Karoo
Minimum distance to water source: 0km
Minimum distance to known local nests: 25,3km

Weather conditions
<table>
<tr><th></th><th>Summer</th><th>Autumn</th><th>Winter</th><th>Spring</th></tr>
<tr><td>Avg. temp</td><td>35,6</td><td>21,2</td><td>16,8</td><td>16,9</td></tr>
<tr><td>Avg. wind speed</td><td>2,4</td><td>0,2</td><td>3,5</td><td>5,8</td></tr>
<tr><td>Wind Direction</td><td>SE</td><td>W</td><td>W</td><td>SE</td></tr>
</table></td><td></td></tr>
<tr><td>VPRK02</td><td>Biotope: Scrub / Slope
Vegetation: Koedoesberge-Moordenaars Karoo
Minimum distance to water source: 1,1km
Minimum distance to known local nests: 21,7km

Weather conditions
<table>
<tr><th></th><th>Summer</th><th>Autumn</th><th>Winter</th><th>Spring</th></tr>
<tr><td>Avg. temp</td><td>30,9</td><td>21</td><td>10,4</td><td>17,1</td></tr>
<tr><td>Avg. wind speed</td><td>4</td><td>4,1</td><td>4,6</td><td>3,6</td></tr>
<tr><td>Wind Direction</td><td>SE/SW</td><td>NW/W</td><td>E/W</td><td>N</td></tr>
</table></td><td></td></tr>
<tr><td>VPRK03</td><td>Biotope: Scrub / Slope
Vegetation: Koedoesberge-Moordenaars Karoo
Minimum distance to water source: 0,8km
Minimum distance to known local nests: 21,1km

Weather conditions
<table>
<tr><th></th><th>Summer</th><th>Autumn</th><th>Winter</th><th>Spring</th></tr>
<tr><td>Avg. temp</td><td>32,8</td><td>20,9</td><td>9,8</td><td>17,1</td></tr>
<tr><td>Avg. wind speed</td><td>5,3</td><td>3,5</td><td>4,6</td><td>3,6</td></tr>
<tr><td>Wind Direction</td><td>E</td><td>NW/W</td><td>W</td><td>N</td></tr>
</table></td><td></td></tr>
<tr><td>VPRK04</td><td>Biotope: Scrub / Slope
Vegetation: Central Mountain Shale Renosterveld
Minimum distance to water source: 1,5km
Minimum distance to known local nests: 13,9km</td><td></td></tr>
</table>

Sampling type	Area	Sampling point	Characterisation	Photo

Weather conditions

	Summer	Autumn	Winter	Spring
Avg. temp	29,7	13,9	17,6	11,4
Avg. wind speed	4,1	3,6	1,6	8,8
Wind Direction	SE	SW	N/NW	W

VPRK05

Biotope: Scrub / Slope
Vegetation: Central Mountain Shale Renosterveld
Minimum distance to water source: 1,7km
Minimum distance to known local nests: 18,2km

Weather conditions

	Summer	Autumn	Winter	Spring
Avg. temp	33,1	14,7	17,1	11,4
Avg. wind speed	3,2	4,2	1,9	5
Wind Direction	W	NW	N/NW	W

VPRK06

Biotope: Scrub
Vegetation: Central Mountain Shale Renosterveld
Minimum distance to water source: 2,1km
Minimum distance to known local nests: 14,3km

Weather conditions

	Summer	Autumn	Winter	Spring
Avg. temp	27,7	23,9	19,4	17,2
Avg. wind speed	5,4	3,2	3,1	5,6
Wind Direction	E/NE	E	NW	E

Control — **VPCO01**

Biotope: Scrub / Slope
Vegetation: Central Mountain Shale Renosterveld
Minimum distance to water source: 1,0km
Minimum distance to known local nests: 2,8km

Weather conditions

	Summer	Autumn	Winter	Spring
Avg. temp	23,5	16,4	17	10,9
Avg. wind speed	5,3	3	6,3	5,3
Wind Direction	E	W	E	N

Sampling type	Area	Sampling point	Characterisation	Photo

VPCO02

Biotope: Scrub / Slope
Vegetation: Central Mountain Shale Renosterveld
Minimum distance to water source: 1,7km
Minimum distance to known local nests: 6,7km

Weather conditions

	Summer	Autumn	Winter	Spring
Avg. temp	26,6	13,9	16,7	11,7
Avg. wind speed	7,9	8,1	5,7	5,3
Wind Direction	S	S	NE	N

VPCO03

Biotope: Scrub / Slope
Vegetation: Central Mountain Shale Renosterveld
Minimum distance to water source: 1,0km
Minimum distance to known local nests: 3,8km

Weather conditions

	Summer	Autumn	Winter	Spring
Avg. temp	31,5	25,1	15,4	18,2
Avg. wind speed	4	5	4,1	4,4
Wind Direction	E/N/NE	N/NW	E/W	S

VPCO04

Biotope: Scrub / Slope
Vegetation: Koedoesberge-Moordenaars Karoo
Minimum distance to water source: 1,6km
Minimum distance to known local nests: 8,5km

Weather conditions

	Summer	Autumn	Winter	Spring
Avg. temp	33,3	23,3	11	21
Avg. wind speed	2,9	3,5	4,8	2,2
Wind Direction	W	E	NW	E

VPCO05

Biotope: Scrub / Slope
Vegetation: Central Mountain Shale Renosterveld
Minimum distance to water source: 1,0km
Minimum distance to known local nests: 5,4km

Weather conditions

	Summer	Autumn	Winter	Spring
Avg. temp	33,4	17,6	12,4	15,7

Sampling type	Area	Sampling point	Characterisation	Photo

	Summer	Autumn	Winter	Spring
Avg. wind speed	3,3	9,8	5	7,9
Wind Direction	E/N/W	E/SE	N	S

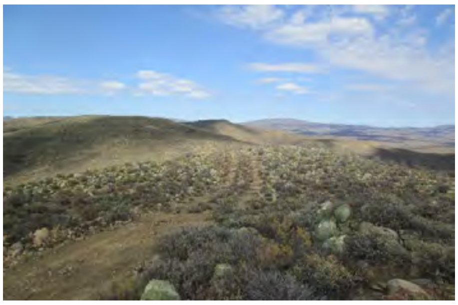
Walked Transects – **Rondekop WEF**

VPCO06

Biotope: Scrub
Vegetation: Koedoesberge-Moordenaars Karoo
Minimum distance to water source: 2,4km
Minimum distance to known local nests: 12km

Weather conditions

	Summer	Autumn	Winter	Spring
Avg. temp	32,2	19,5	15,7	16,5
Avg. wind speed	5,9	3	1,7	4,4
Wind Direction	SE	W	S	W

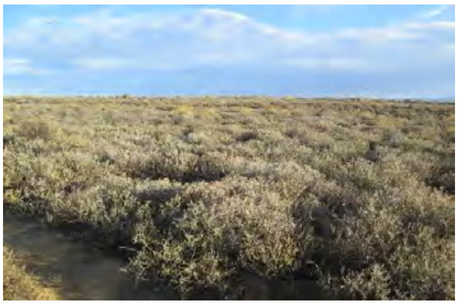


BTRK01

Biotope: Scrub
Vegetation: Koedoesberge-Moordenaars Karoo
Minimum distance to water source: 0,09km
Minimum distance to known local nests: 25,5km

Weather conditions

	Summer	Autumn	Winter	Spring
Avg. temp	26,5	16,8	21,2	20,5
Avg. wind speed	1,2	0,7	6,6	6,4
Wind Direction	SE	W	W	E

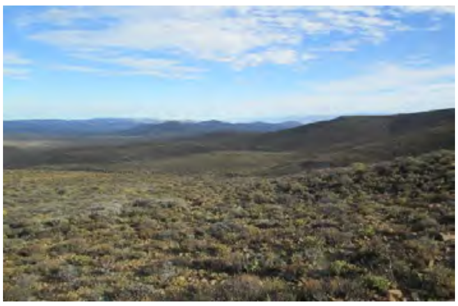


BTRK04

Biotope: Scrub / Slope
Vegetation: Koedoesberge-Moordenaars Karoo
Minimum distance to water source: 0,7km
Minimum distance to known local nests: 20,9km

Weather conditions

	Summer	Autumn	Winter	Spring
Avg. temp	26,8	22,2	10,2	21
Avg. wind speed	7,2	2,6	1,7	3
Wind Direction	SW	W	E	NW



Sampling type	Area	Sampling point	Characterisation	Photo
		BTRK05	Biotope: Scrub / Slope Vegetation: Koedoesberge-Moordenaars Karoo Minimum distance to water source: 0,9km Minimum distance to known local nests: 21,5km	
		BTRK06	Biotope: Scrub / Slope Vegetation: Central Mountain Shale Renosterveld Minimum distance to water source: 1,7km Minimum distance to known local nests: 13,8km	
		BTRK08	Biotope: Scrub / Slope Vegetation: Central Mountain Shale Renosterveld Minimum distance to water source: 1,5km Minimum distance to known local nests: 9,5km	
	Control	BTCO01	Biotope: Scrub / Slope Vegetation: Central Mountain Shale Renosterveld Minimum distance to water source: 0,6km Minimum distance to known local nests: 3km	

BTRK05 – Weather conditions

	Summer	Autumn	Winter	Spring
Avg. temp	26,7	24,1	13,5	21
Avg. wind speed	7,3	3,2	0,9	3
Wind Direction	N	NW	E	NW

BTRK06 – Weather conditions

	Summer	Autumn	Winter	Spring
Avg. temp	26,1	17,8	16,5	5,8
Avg. wind speed	2	4,7	1,5	2,8
Wind Direction	E	N	N	W

BTRK08 – Weather conditions

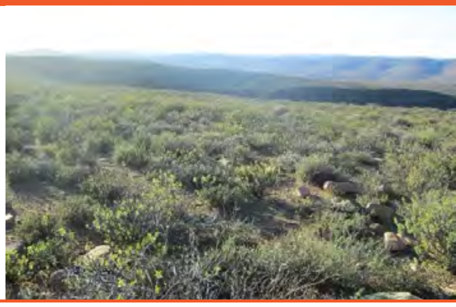
	Summer	Autumn	Winter	Spring
Avg. temp	17,9	15,3	18,7	13
Avg. wind speed	6,5	4,9	7,6	3,4
Wind Direction	E	E	-	N

BTCO01 – Weather conditions

	Summer	Autumn	Winter	Spring
Avg. temp	15	19,9	16,2	20

Sampling type	Area	Sampling point	Characterisation	Photo

	Summer	Autumn	Winter	Spring
Avg. wind speed	6,9	2,2	0	3
Wind Direction	E	W	-	W

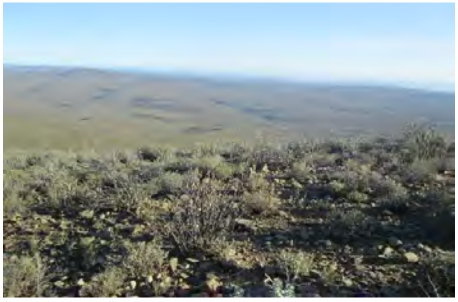


BTCO02

Biotope: Scrub / Slope
Vegetation: Central Mountain Shale Renosterveld
Minimum distance to water source: 1,4km
Minimum distance to known local nests: 6,2km

Weather conditions

	Summer	Autumn	Winter	Spring
Avg. temp	25,3	10,4	16,1	17,7
Avg. wind speed	10,9	9,6	3,8	4,9
Wind Direction	S	E	-	W

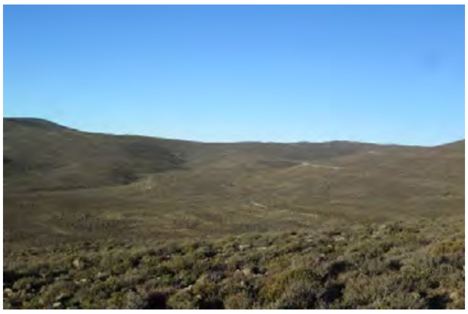


BTCO03

Biotope: Scrub / Slope
Vegetation: Central Mountain Shale Renosterveld
Minimum distance to water source: 0,2km
Minimum distance to known local nests: 3,3km

Weather conditions

	Summer	Autumn	Winter	Spring
Avg. temp	30,1	19,7	16,4	20,9
Avg. wind speed	3,4	2,1	3,4	4,1
Wind Direction	SE	NW	-	NE



BTCO04

Biotope: Scrub / Slope
Vegetation: Central Mountain Shale Renosterveld
Minimum distance to water source: 1,4km
Minimum distance to known local nests: 2,9km

Weather conditions

	Summer	Autumn	Winter	Spring
Avg. temp	26,6	13,1	16,1	17,7
Avg. wind speed	4,9	2,1	0	4,8
Wind Direction	E	E	-	W

Sampling type	Area	Sampling point	Characterisation	Photo

BTCO05

Biotope: Scrub / Slope
Vegetation: Koedoesberge-Moordenaars Karoo
Minimum distance to water source: 0,5km
Minimum distance to known local nests: 8,6km

Weather conditions

	Summer	Autumn	Winter	Spring
Avg. temp	35,5	19,7	10,5	31,2
Avg. wind speed	4,6	2	6,1	1,4
Wind Direction	W	E	-	SW

BTCO06

Biotope: Scrub / Slope
Vegetation: Koedoesberge-Moordenaars Karoo
Minimum distance to water source: 0,7km
Minimum distance to known local nests: 5,2km

Weather conditions

	Summer	Autumn	Winter	Spring
Avg. temp	35,2	10,9	11,4	14,4
Avg. wind speed	3,7	3,1	6	5,4
Wind Direction	SW	E	-	E

BTCO07

Biotope: Scrub / Slope
Vegetation: Central Mountain Shale Renosterveld
Minimum distance to water source: 0,8km
Minimum distance to known local nests: 16,2km

Weather conditions

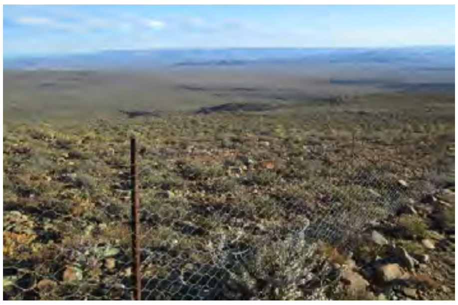
	Summer	Autumn	Winter	Spring
Avg. temp	29,2	23,9	14,9	12
Avg. wind speed	4,6	4,7	1,2	5,2
Wind Direction	E	S	-	S

BTCO08

Biotope: Scrub / Slope
Vegetation: Koedoesberge-Moordenaars Karoo
Minimum distance to water source: 2,7km
Minimum distance to known local nests: 11km

Weather conditions

	Summer	Autumn	Winter	Spring
Avg. temp	25,5	10,7	14,6	12,7
Avg. wind speed	1	4	1,6	6,8



Sampling type	Area	Sampling point	Characterisation					Photo
			Wind Direction	SE	SE	SE	S	

7.4. Appendix IV – Description of Bird Sensitive Species Observations

During the pre-construction monitoring conducted, 25 bird species considered sensitive were confirmed on the site and its surroundings. Especially important are 5 of these species for presenting an unfavourable conservation status (Taylor, Peacock & Wanless 2015). A brief description of these species is offered in this section.

Verreauxs' Eagle (*Aquila verreauxii*) (Figure 29)

Verreauxs' Eagle *Aquila verreauxii* is a resident species in South Africa, occurs mainly in mountainous habitats and rocky areas with cliffs and has a status of Least Concern globally (IUCN 2016), but at a South African level it is considered to be *Vulnerable* (Taylor, Peacock & Wanless 2015). It is considered locally as fairly common, having an estimated population of between 400-2000 pairs in the Western Cape (Hockey, Dean & Ryan 2005). Main threats for this species include prosecution by farmers, pesticides and lack of food, where hyraxes are hunted for food and skins (BirdLife International 2015a).

This species was detected in the summer, winter and spring season, consisting of some individual gliding and perching through the area, mostly at high altitude.

Black Harrier (*Circus maurus*) (Figure 29)

Black Harrier *Circus maurus* is a resident species in South Africa and endemic to Southern Africa, being that over 70% of the world population is confined within the country limits (IUCN 2016). It's considered one of the world's most range-restricted harriers (Hockey, Dean & Ryan 2005). Accordingly to the IUCN 2013 report its world population is considered stable, however it is classified as *Vulnerable* and by the Red List of Conservation for South Africa as *Endangered* (Taylor, Peacock & Wanless 2015). It is usually present in low shrubs type of habitats that it uses for hunting and breeding.

Studies on other species of Harrier, such as the Hen Harrier *Circus pygargus* in Europe, concluded that these species are not very prone to suffer from the impacts of wind energy facilities (Whitfield & Madders 2006). Thus, there are few evidences of displacement and not many records of fatalities associated with this type of project. Nevertheless, there is at least one case study of a Portuguese wind energy facility where high mortality rates of Hen Harrier have been recorded (Bio3 2009), and mitigated through habitat management.

In the study area the species was detected during the winter and spring season. Of these, 3 records were detected flying at rotor swept height, which coupled with the execution of risk behaviours such as soaring, gliding and hunting placed this species in future collision risk with wind turbines. Most of the observations were made from vantage points, indicating that the species actively uses the area.

Ludwig's Bustard (*Neotis ludwigii*) (Figure 29)

Ludwig's Bustard *Neotis ludwigii* is a species considered to have an *Endangered* status in South Africa as well as globally (Taylor, Peacock & Wanless 2015; IUCN 2016). A recent review of the status of its populations has revealed rapid declines, caused to a great extent by collision with power lines (BirdLife International 2014a).

Only one Ludwig's Bustards was observed using the area in the spring season. Of note was an observation of an isolated individual flapping below RSA.

Martial Eagle (*Polemaetus bellicosus*)

Martial Eagle *Polemaetus bellicosus* is a resident species with a widespread but discontinuous distribution. Occurs mainly in open woodland in fairly flat areas including arid savannah and forest edges. Also occurs in open scrubland with drainage lines with clutches of high trees of tall high tension pylons and is rare in mountainous areas (Hockey, Dean & Ryan 2005). Its population is considered *Endangered* in South Africa (Taylor, Peacock & Wanless 2015) with uncommon and of overall decreasing populations. Main threats for the species are: direct persecution by farmers, poisoning and electrocution and collision with power lines, as well as habitat loss (BirdLife International 2015b).

The species was observed in all seasons with the exception of the spring season. It was mostly detected through incidental observation and only in the Control area. It is of note that for all observation made, almost half of the flights were observed at rotor swept height.

Black Stork (*Ciconia nigra*) (Figure 29)

Black Stork *Ciconia nigra* is a *Vulnerable* species in South Africa (Taylor, Peacock & Wanless 2015), though its population trends are largely undetermined at a global scale. Major threats for this species have been mostly due to habitat degradation and loss of habitat since the species wintering grounds in Southern Africa have been under conversion process to other uses. It is also known to sporadically collide with power lines (BirdLife International 2015c). Black Stork is usually found in dams, pans, flood plains, estuaries, marshlands and flooded grassland, though associated with mountainous regions (Hockey, Dean & Ryan 2005).

Two individuals of Black Stork were observed during winter and spring. The flights occurred at RSA, being considered of risk movements.

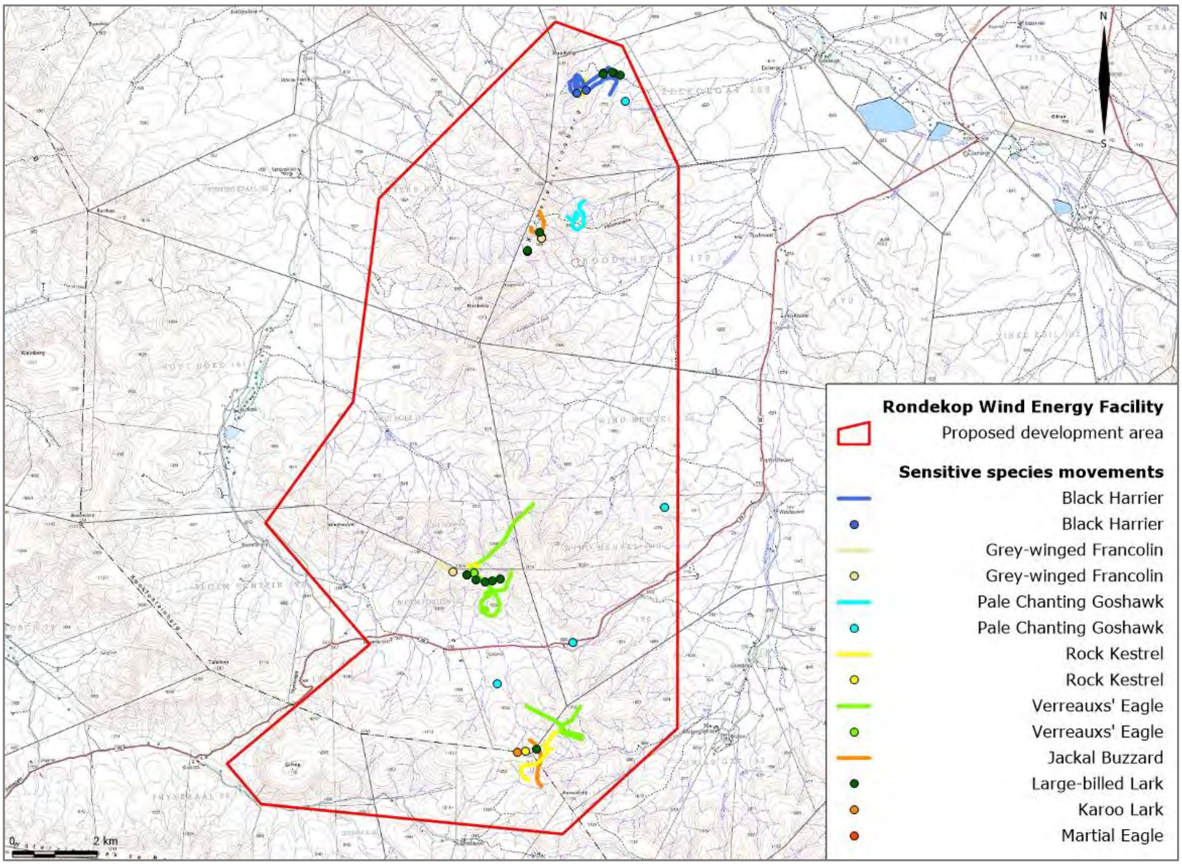


Figure 29 – Observed movements of Black Harrier, Grey-winged Francolin, Pale Chanting Goshawk, Jackal Buzzard, Rock Kestrel, Verreaux's Eagle, Martial Eagle, Karoo Lark, Large-billed Lark during the pre-construction bird monitoring programme at Rondekop WEF.

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