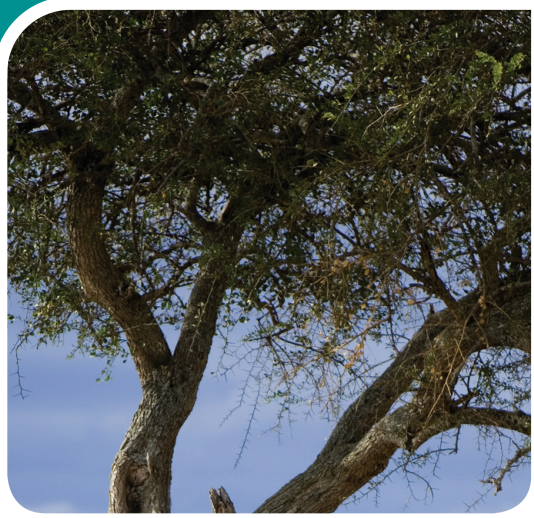
Business and Biodiversity Offsets Programme (BBOP)

Biodiversity Offset Worked Example

Fictional Letabeng Case Study






BBOP
Business and Biodiversity Offsets Programme

Forest Trends, Conservation International and the Wildlife Conservation Society provided the Secretariat for BBOP during the first phase of the programme's work (2004 – 2008).

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About this document

The Principles on Biodiversity Offsets and accompanying supporting materials[1] such as this case study paper giving a fictional worked example[2] have been prepared by the Business and Biodiversity Offsets Programme (BBOP) to help developers, conservation groups, communities, governments and financial institutions that wish to consider and develop best practice related to biodiversity offsets. They were developed by members of the BBOP Secretariat and Advisory Committee[3] during the first phase of the programme's work (2004 – 2008), and have benefited from contributions and suggestions from many of the 200 people who registered on the BBOP consultation website and numerous others who have joined us for discussions in meetings.

The Advisory Committee members support the Principles and commend the other working documents to readers as a source of interim guidance on which to draw when considering, designing and implementing biodiversity offsets. Best practice in biodiversity offsets is still in its infancy, and the concepts and methodologies presented here need to be further discussed, developed, tested and refined based on more practical experience and broad debate within society.

All those involved in BBOP are grateful to the companies who volunteered pilot projects in this first phase of our work and for the support of the donors listed overleaf, who have enabled the Secretariat and Advisory Committee to prepare these documents.

BBOP is embarking on the next phase of its work, during which we hope to collaborate with more individuals and organisations around the world, to test and develop these and other approaches to biodiversity offsets more widely geographically and in more industry sectors. BBOP is a collaborative programme, and we welcome your involvement. To learn more about the programme and how to get involved please:

See: **www.forest-trends.org/biodiversityoffsetprogram/**

Contact: **bbop@forest-trends.org**

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1 The BBOP Principles, interim guidance and resource documents, including a glossary, can be found at **www.forest-trends.org/biodiversityoffsetprogram/guidelines/**. To assist readers, a selection of terms with an entry in the BBOP Glossary has been highlighted thus: BIODIVERSITY OFFSETS. Users of the Web or CD-ROM version of this document can move their cursors over a glossary term to see the definition.

2 This paper was prepared by Marc Stalmans, Anthony Emery and Maryanne Grieg-Gran.

3 The BBOP Advisory Committee currently comprises representatives from: Anglo American; Biodiversity Neutral Initiative; BirdLife International; Botanical Society of South Africa; Brazilian Biodiversity Fund (FUNBIO); Centre for Research-Information-Action for Development in Africa; City of Bainbridge Island, Washington; Conservation International; Department of Conservation New Zealand; Department of Sustainability & Environment, Government of Victoria, Australia; Ecoagriculture Partners; Fauna and Flora International; Forest Trends; Insight Investment; International Finance Corporation; International Institute of Environment and Development; IUCN, The International Union for the Conservation of Nature; KfW Bankengruppe; Ministry of Ecology, Energy, Sustainable Development, and Spatial Planning, France; Ministry of Housing, Spatial Planning and the Environment, The Netherlands; National Ecology Institute, Mexico; National Environmental Management Authority, Uganda; Newmont Mining Corporation; Private Agencies Collaborating Together (Pact); Rio Tinto; Royal Botanic Gardens, Kew; Shell International; Sherritt International Corporation; Sierra Gorda Biosphere Reserve, Mexico; Solid Energy, New Zealand; South African National Biodiversity Institute; Southern Rift Landowners Association, Kenya; The Nature Conservancy; Tulalip Tribes; United Nations Development Programme (Footprint Neutral Initiative); United States Fish and Wildlife Service; Wildlife Conservation Society; Wildlands, Inc.; WWF; Zoological Society of London; and the following independent consultants: Susie Brownlie; Jonathan Ekstrom; David Richards; Marc Stalmans; and Jo Treweek.

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4 Endorsement of some or all of the BBOP documents is not implied by financial support for BBOP's work.

5 This document is made possible in part by the generous support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of Forest Trends, Conservation International and the Wildlife Conservation Society and do not necessarily reflect the views of USAID or the United States Government.

Contents

This fictional worked example has been prepared to illustrate how some methods developed by BBOP can apply the principles for biodiversity offsets in a fictional case study. The worked example has adapted real biological data from a certain part of South Africa to characterise the fictitious Letabeng area. The species data, HABITAT TYPES, conservation value, and habitat condition are plausible for a scenario such as this one. However, **the new kaolin mine for which the offset is being designed, the individual properties named in this example, and the proposed site and nature of the development, the regulatory aspects, institutional response and ownership issues are totally fictitious and do not match any reality on the ground**.

The Worked Example starts with a summary, and then works through the broad steps outlined in the BBOP Offset Design Handbook using the methods adapted during the BBOP process and described in Appendix C.1 of the Offset Design Handbook. The final design for this fictional offset is summarised in Table 17 on page 51.

Appendix A illustrates how the Biodiversity Offset Cost-Benefit Handbook can be used and integrated into the final offset design.

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Introduction to BBOP

The Business and Biodiversity Offsets Programme (BBOP) is a partnership between companies, governments, conservation experts and financial institutions that aim to explore whether, in the right circumstances, biodiversity offsets can help achieve better and more cost effective CONSERVATION OUTCOMES than normally occur in infrastructure development, while at the same time helping companies manage their risks, liabilities and costs. BBOP has been researching and developing best practice on biodiversity offsets and beginning to test it through a portfolio of pilot projects in a range of contexts and industry sectors, aiming to demonstrate improved and additional conservation and business outcomes. BBOP's expectation is that biodiversity offsets will become a standard part of the development process when projects have a significant RESIDUAL IMPACT on biodiversity, resulting in long term and globally significant conservation outcomes.

The Principles on Biodiversity Offsets (see Box 1) and accompanying supporting materials such as this resource document have been prepared by BBOP to help developers, conservation groups, communities, governments and financial institutions that wish to consider and develop best practice biodiversity offsets.

They were developed by members of the BBOP Secretariat and Advisory Committee during the first phase of the programme's work (from November 2004 – December 2008). They reflect discussion by members of the BBOP Advisory Committee, some practical experience through trials at the BBOP pilot project sites, and have also benefited from contributions and suggestions from many of the 200 people who registered on the BBOP consultation site and numerous others who have participated in workshops and meetings.

Box 1: Principles on Biodiversity Offsets supported by the BBOP Advisory Committee

Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development[6] after appropriate prevention and mitigation measures have been taken. The goal of biodiversity offsets is to achieve no net loss and preferably a net gain of biodiversity on the ground with respect to species composition, habitat structure, ecosystem function and people's use and cultural values associated with biodiversity.

These principles establish a framework for designing and implementing biodiversity offsets and verifying their success. Biodiversity offsets should be designed to comply with all relevant national and international law, and planned and implemented in accordance with the Convention on Biological Diversity and its ecosystem approach, as articulated in National Biodiversity Strategies and Action Plans.

1. **No net loss:** A biodiversity offset should be designed and implemented to achieve in situ, measurable conservation outcomes that can reasonably be expected to result in no net loss and preferably a net gain of biodiversity.
2. **Additional conservation outcomes:** A biodiversity offset should achieve conservation outcomes above and beyond results that would have occurred if the offset had not taken place. Offset design and implementation should avoid displacing activities harmful to biodiversity to other locations.
3. **Adherence to the mitigation hierarchy:** A biodiversity offset is a commitment to compensate for significant residual adverse impacts on biodiversity identified after appropriate AVOIDANCE, minimisation and on-site rehabilitation measures have been taken according to the mitigation hierarchy.
4. **Limits to what can be offset:** There are situations where residual impacts cannot be fully compensated for by a biodiversity offset because of the irreplaceability or vulnerability of the biodiversity affected.
5. **Landscape context:** A biodiversity offset should be designed and implemented in a landscape context to achieve the expected measurable conservation outcomes taking into account available information on the full range of biological, social and cultural values of biodiversity and supporting an ecosystem approach.
6. **Stakeholder participation:** In areas affected by the project and by the biodiversity offset, the effective participation of stakeholders should be ensured in decision-making about biodiversity offsets, including their evaluation, selection, design, implementation and monitoring.
7. **Equity:** A biodiversity offset should be designed and implemented in an equitable manner, which means the sharing among stakeholders of the rights and responsibilities, risks and rewards associated with a project and offset in a fair and balanced way, respecting legal and customary arrangements. Special consideration should be given to respecting both internationally and nationally recognised rights of indigenous peoples and local communities.
8. **Long-term outcomes:** The design and implementation of a biodiversity offset should be based on an ADAPTIVE MANAGEMENT approach, incorporating MONITORING AND EVALUATION, with the objective of securing outcomes that last at least as long as the project's impacts and preferably in PERPETUITY.
9. **Transparency:** The design and implementation of a biodiversity offset, and communication of its results to the public, should be undertaken in a transparent and timely manner.
10. **Science and traditional knowledge:** The design and implementation of a biodiversity offset should be a documented process informed by sound science, including an appropriate consideration of traditional knowledge.

6 While biodiversity offsets are defined here in terms of specific development projects (such as a road or a mine), they could also be used to compensate for the broader effects of programmes and plans.

Introduction to the Fictional 'Worked Example'

This 'Worked Example' has been prepared to illustrate how methods developed and adapted by BBOP can apply the principles for biodiversity offsets in a fictional case study. The BBOP pilot project case studies provide real examples, but they have not yet completed the design of their offsets. One purpose of this worked example is to illustrate the design of a biodiversity offset from beginning to end, using the methods outlined in Appendix C.1 of the Offset Design Handbook Appendices (see **www.forest-trends.org/biodiversityoffsetprogram/guidelines/odh.pdf** for the Offset Design Handbook and **www.forest-trends.org/biodiversityoffsetprogram/guidelines/odh-appendices.pdf** for its Appendices).

The worked example has adapted real biological data from a certain part of South Africa to characterise the fictitious Letabeng area. The species data, habitat types, conservation value, and habitat condition are plausible for a scenario such as this one. However, **the new kaolin mine, the individual properties named in this example, and the proposed site and nature of the development, regulatory aspects, institutional response and ownership issues are totally fictitious and do not match any reality on the ground**. Although the STAKEHOLDERS mentioned are based on similar existing government institutions, other statutory bodies and NGOs, the entities named here do not exist. As far as possible, the likely project impacts have been identified as they would be for a real kaolin mine. The calculations as to the required offset in response to the predicted BIODIVERSITY LOSSES are based on actual biological data and the conservation planning priorities for one of the South African provinces.

Summary

The following is an abbreviated version of the different steps that were followed in applying the BBOP methodology to offset the impacts on biodiversity of the proposed development.

The planned development whose biodiversity losses need to be offset consists of a kaolin mine covering approximately 160 ha in the fictional Letabeng district in the south-eastern part of South Africa. This is a region with high altitude grassland in relatively pristine condition, with numerous wetlands and small Afromontane forest patches. In addition to its BIODIVERSITY CONSERVATION value, the area is significant in terms of delivery of numerous important ECOSYSTEM FUNCTIONS, such as water catchment and the provision of grazing and other natural resources. The grasslands, wetlands and forest mosaic provide great habitat variety and thus support a large diversity of plants, birds, reptiles and amphibia. Land is both privately-owned (mostly by commercial farmers) and communally-owned (mostly by small subsistence farmers). Sheep and cattle production are very important in this largely rural area. Birding and fly-fishing have become increasingly popular tourism activities. These two economic activities are dependent on a healthy environment, clean water and a natural land cover. Indigenous plants are also used for traditional medicinal and cultural purposes by the local inhabitants.

The intention is to achieve NO NET LOSS of biodiversity. The approach to determining no net loss taken for this project is to aim for no change or a net gain in the overall PERSISTENCE of populations of species. The method used to measure this is to calculate the loss and gain of key biodiversity ATTRIBUTES selected to serve as good SURROGATES for overall biodiversity, in terms not only of spatial extent (area), but also of CONDITION and amount of biodiversity. Finally, biodiversity values embrace not only the survival of species, but people's use and cultural enjoyment of biodiversity. Therefore the approach taken here to no net loss also establishes measures that ensure people are compensated for the impacts of the mine and the offset activities on their LIVELIHOODS and AMENITIES. The METRICS for the assessment of no net loss thus include:

(a) HABITAT HECTARES, for an overall assessment of the amount of biodiversity lost and gained;

(b) Species persistence metrics for two key species; and

(c) A package of activities and COMPENSATION needed to address impacts on local people's use and enjoyment of biodiversity and secure their involvement in and support for the offset.

In **Step 1** the principal aspects of the project are defined and preliminary site boundaries are delimited. It is also important to define the project context – namely the project fits within a larger surrounding landscape. This first step is to understand the scope of the project that will have an impact on biodiversity. This step entails clearly listing the various components of the project and their location, the duration of their impact and the degree of certainty regarding the likelihood of the impact actually occurring. The impacts of the principal aspects of the project are translated into a map of the study area. The DIRECT IMPACTS involve the near-total loss of the current vegetation cover. Any rehabilitation will still only result in secondary grassland that will for many decades be low in species diversity relative to the original grasslands. The neighbouring NtabaManzi community has had informal access to the site and has been grazing sheep and cattle on it for many years. The development of the mine will significantly reduce the amount of land available to their livestock. In addition, local healers will no longer be able to access the area to collect medicinal plants. The INDIRECT IMPACTs are dual. Firstly, there is a risk of increased sediment loads in the streams as well as a risk of

pollution. Secondly, there are noise and dust impacts associated with the increased traffic along the access roads to the mine. The direct impacts are largely unavoidable. However, the indirect impacts can to a large degree be avoided and mitigated.

The relevant stakeholders are identified in **Step 2** and an initial PARTICIPATION plan is developed. Stakeholders are persons or groups who are affected by or can affect the outcome of the project. It is important to identify the full range of stakeholders. In the case of the Worked Example, there is a broad range of stakeholders from the government, NGO and the private and community sector. They are mostly concerned with maintaining a healthy, natural environment as these stakeholders rely for their economic activities on a largely unmodified land cover.

Step 3 requires the review of any regulatory or legal requirements that may exist nationally or locally for a biodiversity offset. In the case of the Worked Example there is no offset legislation in force. However, the principle of offsets has already been used in the Province by the Department of Environmental Affairs and the provincial conservation authority with regard to wetland losses by another mine. This previous instance, however, did not involve any quantification of the loss of biodiversity caused by the project and GAINS that could be achieved by the offset.

The KEY BIODIVERSITY COMPONENTS occurring at the impact site are identified in **Step 4**. It is important to understand which biodiversity components are of particular significance within the area affected by the project. This information is necessary to evaluate the losses as a result of the impact and to design an offset that can demonstrably deliver CONSERVATION GAINS for the key biodiversity components. A 'Key Biodiversity Components Matrix' has been compiled for the area affected by the project. The key elements include the Letabeng Montane Grassland and the Pindhela Moist Grassland habitats as well as different bird species including two lark species and the Yellowbreasted Pipit. The potential significance of the project's impacts on the key biodiversity components of conservation significance is then identified. Once the potential impacts have been identified, the MITIGATION HIERARCHY can be applied in order to quantify and map the expected residual impacts of the project, thus clarifying what will need to be offset. This involves identifying the potential project impacts on biodiversity components, identifying mitigation and offset measures and lastly quantifying residual biodiversity impacts.

Separately (see Appendix A below) an assessment is made using the Biodiversity Offset Cost-Benefit Handbook (see **www.forest-trends.org/biodiversityoffsetprogram/guidelines/cbh.pdf**) of the package of activities and compensation needed to address impacts on local people's use and enjoyment of biodiversity and secure their involvement in and support for the offset.

In **Step 5**, the project's residual impacts on biodiversity must be quantified in order to determine the amount of offset that is required. A decision must also be made on the metrics to be used to measure the loss of biodiversity caused by the impact and the potential gains offered through the offset. The habitat hectares approach was selected for the Worked Example. However, as this approach focuses solely on habitat this may not sufficiently capture the potential losses with respect to particular species. Therefore a supplementary method based on 'Species occupancy' was also applied to two key species of birds.

Next a shortlist of POTENTIAL OFFSET SITES is compiled (**Step 6)**. The required activities on those sites are defined. In this instance, the list of potential offset sites was limited to four discrete units ('farms' in the South African cadastral context) that are currently on the market. Another offset option involves the Clearfountain farm that is already owned by the Provincial conservation authorities but that is poorly protected and managed. Potential activities that engage local people in the offset and compensate them for any residual impacts of the project on their livelihoods and CULTURAL VALUES are also outlined.

The most appropriate offset sites and activities are then selected in **Step 7** from the shortlist. The offset gains that could be selected for these sites are calculated. In the case of this Worked Example, none of the shortlisted farms can alone fully offset the anticipated biodiversity losses. It is recommended that the farm Sweetwater should be acquired (142% of required offset for Letabeng Montane Grassland and 83% of Pindhela Moist Grassland). This farm is also located most closely to the impact site which makes a good logical choice as an offset. The shortfall in Afrotemperate Forest and Pindhela Moist Grassland must be offset through other means. The acquisition of a second farm was not considered to be viable proposition. Interventions in support of the Provincial conservation authority on the farm Clearfountain make more conservation sense. In this Worked Example, the required offset was thus found IN-KIND, partly on Sweetwater and secondly through supporting activities on Clearfountain. The interventions on Clearfountain do not involve acquiring the land, but rather supporting the conservation efforts of the Provincial organisation in an area of recognised higher conservation value than the area affected by the kaolin mine. This part of the offset thus represents a kind of 'trading-up'.

View of the proposed offset site (Sweetwater property located to the left of the pine plantation). Note the short grasslands (Letabeng Montane Grassland). These grasslands are threatened by further afforestation with pines or by the invasive spread of self-sown pines. This reduces the quality of the habitat for the ENDEMIC bird species. It also reduces water runoff into the rivers used downstream by local communities and farmers.

Finally, in **Step 8** the final choice of activities for the biodiversity offset and their location are described in detail. The principal activities include core offset activities to deliver measurable *in situ* conservation outcomes. In addition, there is a need for supporting activities in terms of institutional structures, liaison with stakeholders and environmental education.

Detailed Worked Example

Background to the proposed development

The proposed activity is the development of a kaolin mine (Box 2) covering approximately 160 ha in the fictional Letabeng district of the Kwazulu Natal Province of South Africa. The mine is likely to operate for 22 years. The Letabeng area (Map 1) is a region with high altitude grassland in relatively pristine condition, with numerous wetlands and small Afromontane forest patches occurring in protected gullies and along south-facing slopes. In addition to its value for biodiversity conservation, the area is significant in terms of delivery of important ecosystem functions (such as water catchment and the provision of grazing and other natural resources). The combination of grasslands interspersed with numerous wetlands provides great habitat variety and thus supports a large diversity of plant, bird, reptile and amphibian species, many of which are ENDEMIC. Local people rely on the region's ecosystem functions and regularly use its services. Land is both privately-owned (mostly by commercial farmers) and communally-owned (mostly by small subsistence farmers). Sheep and cattle production are very important in this largely rural area. Dryland cropping of mostly maize is also important. The livestock farming is dependent on the grazing resource. Birding and fly-fishing have become increasingly popular tourism activities. These two economic activities are dependent on a healthy environment, clean water and a natural land cover. Indigenous plants are also used for traditional medicinal and cultural purposes (see photographs). The settlement pattern in the Letabeng district is a combination of the following:

- Commercial farmers living with their immediate family on properties totalling several hundreds or thousands of hectares;
- Subsistence farmers in homesteads with their extended family at a higher density than commercial farmers (see photographs);
- Small towns that serve the outlying rural communities.

Box 2: Kaolin

The word *kaolin* is derived from the name of the Chinese town Kao-Ling (or Gaoling, 'high ridge'), located in the Jiangxi Province of southeast China. The word *kaolin* is now used as a loose trade and geological term to refer to white clayey rock that is predominantly composed of Kaolin Group (khandite) minerals. The most common constituent is the mineral kaolinite. Kaolinite is a layered aluminosilicate $Al_2Si_2O_5(OH)_4$, and it most often occurs as plate-like, hexagonally shaped crystals.

In the crude form kaolin has limited uses, however beneficiated kaolin is widely used in the paper coating industry. It is also used as a filler (added to plastics, for example, and rubber compounds), as a pigment additive in paints, in ceramics (tile, chinaware, and bathroom toilets and sinks), and in pharmaceuticals. Depending upon the application, kaolins are typically processed to remove such naturally coexisting materials as quartz, iron oxides, titanium oxides, other clay minerals, and organic matter. The waste mica and quartz can be used to back fill the mine thus assisting with the rehabilitation of the area.

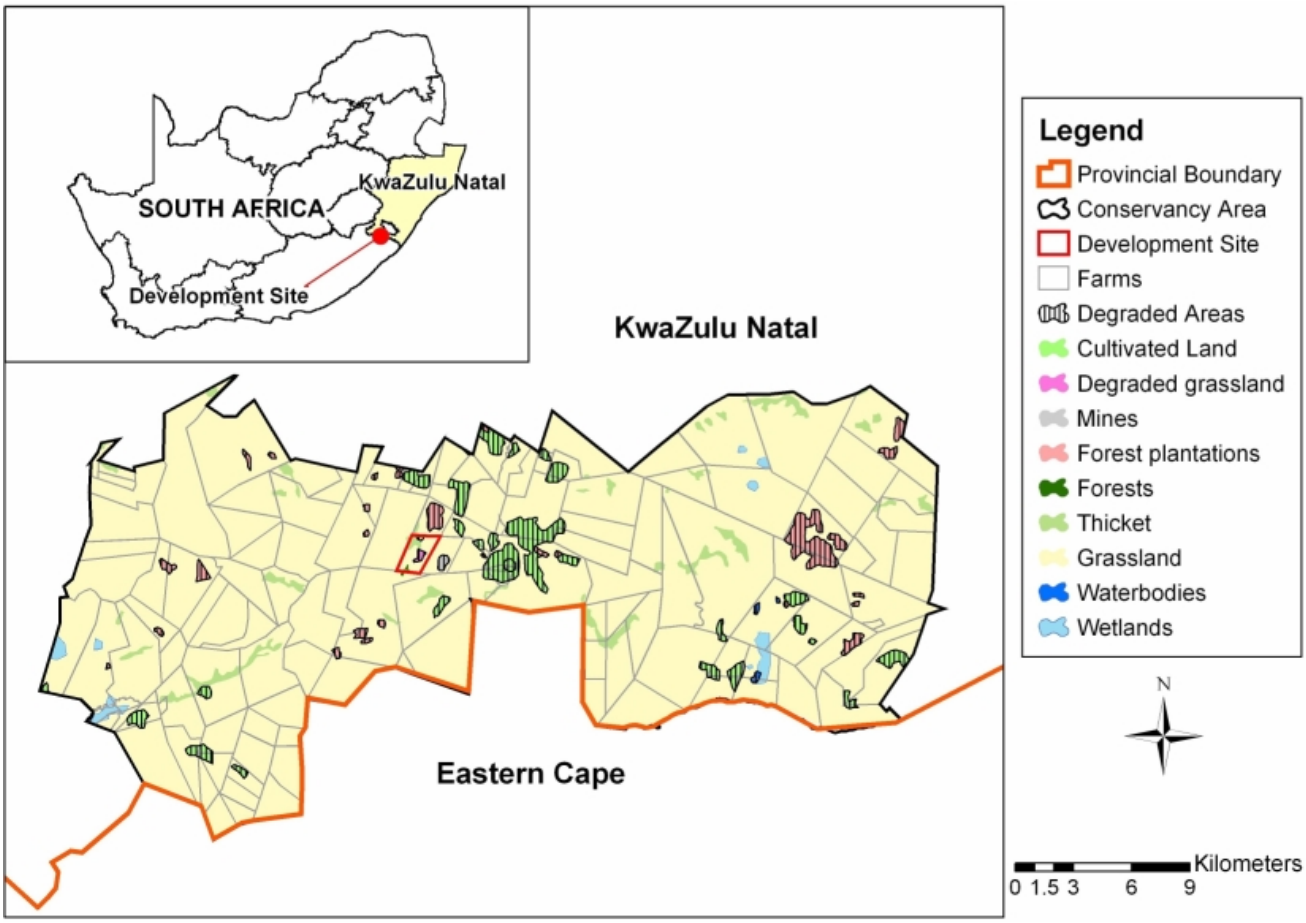
Kaolin is generally mined from near surface ore bodies (less than 150 m deep) that are 3 to 15 m thick.

The Letabeng area lies within the project domain of the eMakhata Grassland Headwaters Project. The eMakhata Project formally began four years ago and has been funded by the Global Wildlife Foundation and the African Investment Bank Green Trust. Since late last year, the project has operated under the auspices of the Flora Society of Southern Africa. It focuses on cooperative conservation approaches towards conserving biodiversity on private, communal and state land whilst making it worth the while of the landowners and users concerned. The predominant land use in the district is rangeland farming. It is clear that these practices have for the most part been sustainably implemented. The area is a well-known birding destination and ECOTOURISM activities have grown considerably over the last decade.

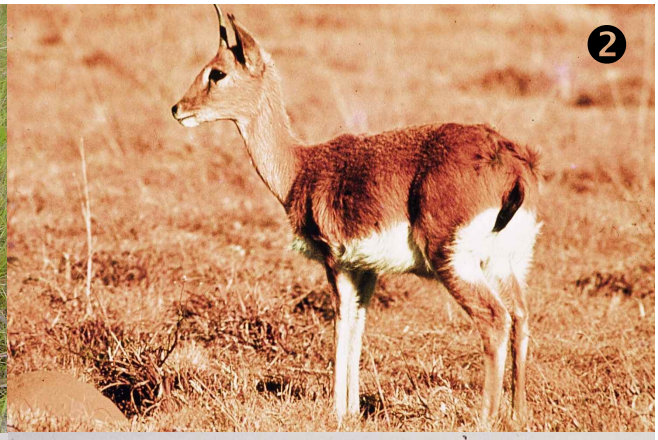
Although these grasslands extend into the Eastern Cape Province to the south, the Worked Example is confined to the Kwazulu Natal Province because of issues of regional GOVERNANCE, differences in conservation emphasis, etc.

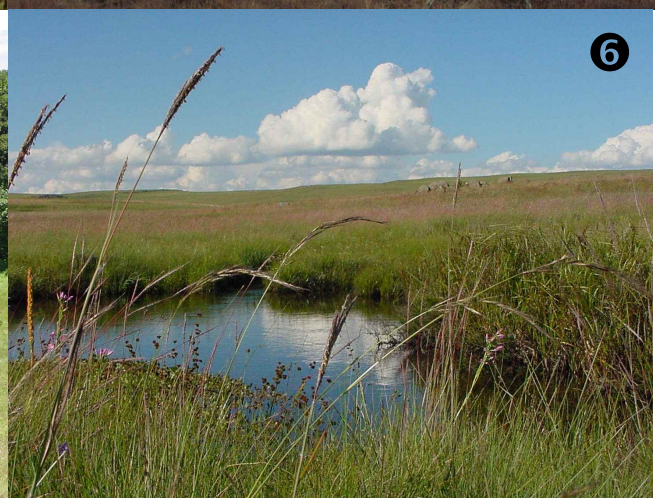
When the kaolin mine was first proposed, the interplay between the mine proponent, members of the public and NGOs who objected to the likely environmental impacts of the mine, central government and the local municipal authority was intense, but eventually resulted in the granting of the mining licence in 2007. The recommendations of the ENVIRONMENTAL IMPACT ASSESSMENT were used to guide the setting of conditions under which the mine could be operated. These were expressed as conditions related to the mining operation, noise, dust, effluent, soil, ecology, visual impact, road use, rehabilitation and mine CLOSURE. The conditions did not stipulate a biodiversity offset. However, the mining company wishes to operate with the support of stakeholders such as central and local government, local communities and conservation NGOs. The company is aware that it may submit applications for other kaolin mine projects in Kwazulu Natal Province and elsewhere in South Africa in the future, and believes that demonstrating no net loss, and even a NET GAIN, of biodiversity around this mine site will build its reputation and the trust of its stakeholders. It hopes this will support a social license to operate that could save time and money for this kaolin mine and for future operations, and help distinguish the company from competitors for mining concessions in the future.

Map 1: Locality of proposed kaolin mine in the Letabeng area of South Africa



Views of the Letabeng area and its biodiversity attributes





❶ *Brunsvigia* – bulb used for medicinal purposes

❷ Oribi antelope

❸ Rural community that is dependent on remittances, maize cropping and livestock grazing

❹ Wingshooting

❺ Afrotemperate forest occurring in discrete pockets in gullies and other sheltered landscape positions

❻ Wetland in extensive grasslands

Step 1: Define the principal aspects of the project, delimit preliminary site boundaries and determine the landscape context of the project

The first step is to understand the scope of the project that will have an impact on biodiversity. This step entails clearly listing the various components of the project and their (approximate) locations (Map 2), the duration of their impact and the degree of certainty regarding the likelihood of the impact actually occurring. The impacts of the principal aspects of the project are translated into a map of the study area which also provides LANDSCAPE CONTEXT. The DIRECT and INDIRECT IMPACTS are plotted.

The direct impacts mostly involve the near total loss of the current vegetation cover. Any rehabilitation will still only result in secondary grassland that will for many decades be low in species diversity relative to the original grasslands. The neighbouring NtabaManzi community has had informal access to the site and has been grazing sheep and cattle for many years. The development of the mine will significantly reduce the amount of land available to their livestock. Another direct impact is that members of the local traditional healers' association will no longer be able to collect medicinal plants from the site. The indirect impacts are dual. Firstly, there is a risk of increased sediment loads in the streams as well as a risk of pollution. Secondly, there are noise and dust impacts associated with the increased traffic (including heavy trucks) along the access roads to the mine.

The direct impacts are largely unavoidable. However, the indirect impacts can to a large degree be avoided and mitigated.

Broad habitat description of the project area

Three habitats are found in the project area. Firstly, the Letabeng Montane Grassland covers the higher parts of the landscape. This is a short (<0.50 m) grassland with a very high diversity of plant species, in particular bulbs and corms. Secondly, the Pindhela Moist Grassland is found on the lower slopes. This is a taller grassland (0.50 – 1.00 m) with a moderately high species diversity. The third habitat, the Northern Afrotemperate Forest is only found along drainage lines in sheltered positions that protect it from the frequent fires through the landscape. Paradoxically, based on palynological (pollen analysis) evidence, the grasslands are much more ancient than the forest. The grasslands also have higher levels of ENDEMISM, further attesting to their antiquity. These three habitats are found across a much wider landscape.

Table 1: Project activities and components

Lifecycle stage	Activity or component	Location	Duration*	Degree of certainty**
Exploration Seismic reflection profiles and boreholes (drilling required)	Provide access (temporary roads and tracks)	On-site	Permanent	High
	Set up and operate camps	On-site	Long-term temporary	High
	Use of resources (water, aggregate)	On-site	Long-term temporary	High
	Shot hole drilling	On-site	Short-term temporary	High
	Use of explosives	On-site	Short-term temporary	High
	Closure of shot holes, mud pits, camps and access infrastructure	On-site	Short-term temporary	High
	Mobilise drill rig	On-site	Short-term temporary	Medium
	Drilling operations	On-site	Short-term temporary	Medium
	Testing of ore	Off-site	Short-term temporary	High
Construction	Habitat clearing	On-site	Permanent	High
	Set-up and operate construction camps	On-site	Short-term temporary	High
	Provide construction access	On-site	Short-term temporary	High
	Resource use (water, timber, aggregate)	On-site	Short-term temporary	High
	Import of heavy plant and machinery	On-site	Short-term temporary	High
	Vehicle movements	On-site	Short-term temporary	High
	Earthmoving, foundations, excavation	On-site	Short-term temporary	High
	Storage / use of fuel and construction materials	On-site	Short-term temporary	High
	Generation of construction wastes	On-site	Short-term temporary	High

Lifecycle stage	Activity or component	Location	Duration*	Degree of certainty**
Construction **Operation / Production**	Habitat clearing	On-site	Permanent	High
	Direct footprint	On-site	Permanent	High
	Visible presence	On-site & Off-site	Permanent	High
	Import and export of materials and products	On-site & Off-site	Permanent	High
	Product handling, storage, use of chemicals and fuel	On-site	Permanent	High
	Solid wastes arising	On-site	Permanent	High
	Chemicals storage, handling and use	On-site	Permanent	High
	Liquid effluent	On-site & Off-site	Permanent	High
	Emissions to atmosphere	On-site & Off-site	Permanent	High
	Noise	On-site & Off-site	Permanent	High
	Light	On-site & Off-site	Permanent	High
Decommissioning / Closure	Closure of mining pits and underground excavations	On-site	Short-term temporary	High
	Closure of storage sites	On-site	Short-term temporary	High
	Demolishing of construction camps	On-site	Short-term temporary	Medium
	Closure of access roads	On-site	Short-term temporary	Medium
	Rehabilitation of mining pits	On-site	Short-term temporary	High
	Rehabilitation of waste sites (slack dumps etc.)	On-site	Short-term temporary	High
	Rehabilitation of access roads	On-site	Short-term temporary	Medium
	Monitoring of site for liquid and gaseous emissions.	On-site & Off-site	Long-term temporary	Medium

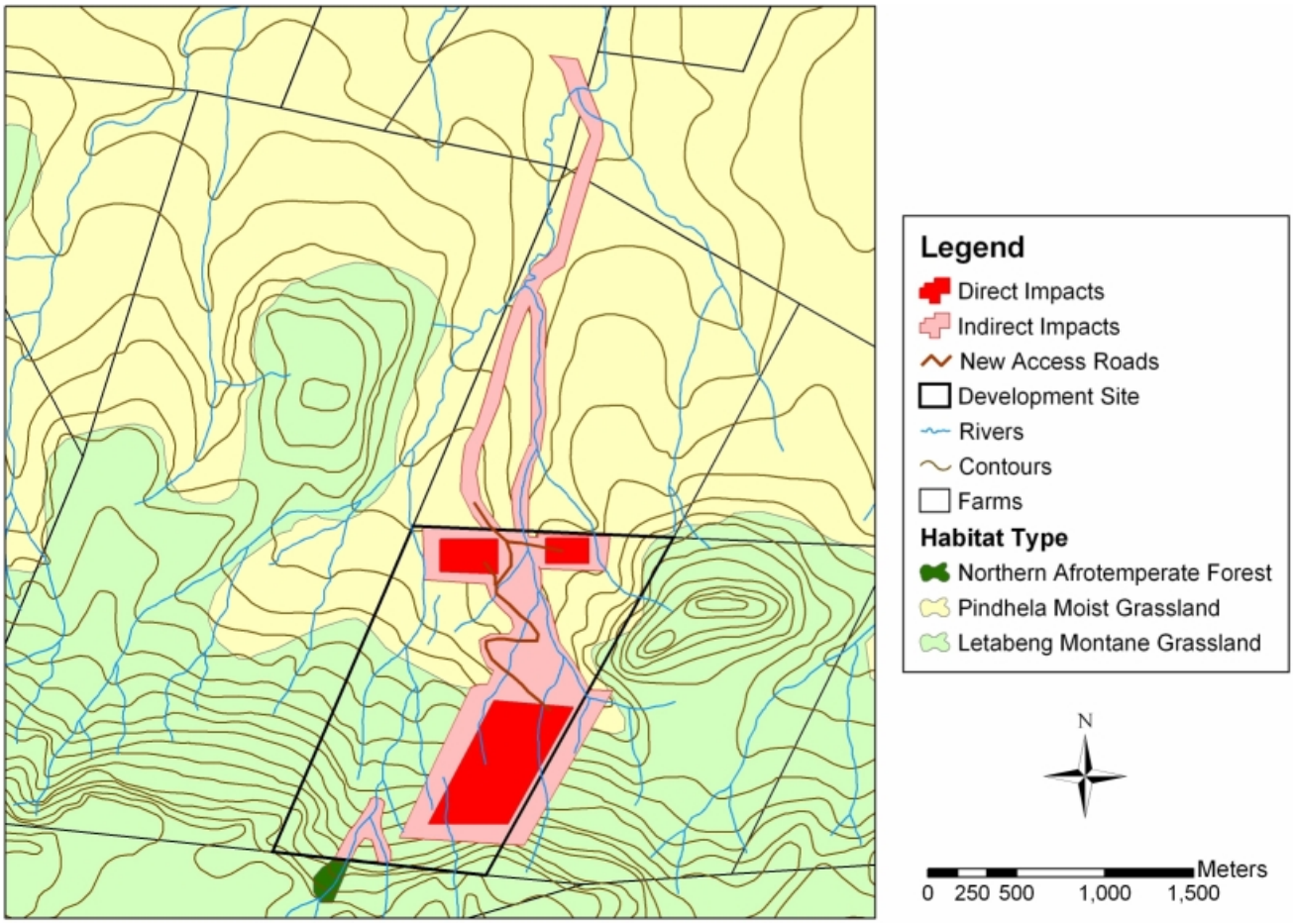
* Duration relates to the activity or component, e.g. permanent (for the duration of the project), long-term temporary, short-term temporary, transient or other appropriate definitions.

** Degree of certainty relates to one or more of: the activity or component, its location and its duration (in certain cases the exact nature of some aspects of the project may be unconfirmed, uncertain or unknown). A qualitative assessment of certainty should be made (e.g. high, medium and low). Where uncertainty exists, the table should be revised as additional information becomes available.

In summary, the above activities will impact as follows:

Habitat types	Direct impact (ha)	Indirect impact (ha)
Letabeng Montane Grassland	29.95	28.34
Pindhela Moist Grassland	10.15	84.92
Northern Afrotemperate Forest	0.00	5.40
TOTAL	40.00	118.66

Map 2: Layout of mine and direct and indirect impact areas



Step 2: Identify relevant stakeholders and develop an initial participation plan

Stakeholders are persons or groups who are affected by or can affect the outcome of the project. It is important to identify the full range of stakeholders. In the case of the Worked Example, there is a broad range of stakeholders from the government, NGO and private and community sector. They are mostly concerned with maintaining a healthy, natural environment as these stakeholders rely on a largely unmodified land cover.

Different stakeholders need to be engaged and consulted at different stages of the process. Some stakeholders may only be involved for a short period of time whereas others will become permanent partners, especially those with a high degree of local knowledge and a direct interest as neighbours.

The resources that will be required by the company to engage these stakeholders vary depending on the particular nature of the stakeholders and the timing in the process. It is critically important that the different stakeholders are approached with the right attitude and empathy. Some stakeholder groups are sophisticated users of information technology and participate in international financial markets. Some are strongly culturally attached to their natural resource base and may have little involvement in wider markets where many values of land and natural resources are reduced to a common financial currency. The resources required for effective PARTICIPATION of all the stakeholders will need to cover not only the company's staff time in working with them during the design of the project and offset, but also advertisements in national and local newspapers (for the EIA process), EIA public participation workshops, newsletters, annual public meetings, regular community liaison, open days with site visits, webpage and email address and telephone number for queries and complaints. Continuity in the interaction with local communities in particular will be vitally important if the company is to succeed in its aim of building genuine trust during a relationship with them for the duration of the mine's exploitation that is expected to last more than 20 years.

The key stages for engagement and timing with respect to different stakeholder groups is summarised in Table 2, using the following key:

A = 6 months prior to exploration (company approaches stakeholders for specialist input).

B = exploration application (3 month process to obtain exploration permit from Department of Minerals & Mining).

C = ENVIRONMENTAL IMPACT ASSESSMENT phase (including public participation process) (10 months in duration due to appeals by stakeholders).

D = offset design (7 months).

E = mine development phase (24 months).

F = operational phase (with rolling rehabilitation) (22 years).

G = CLOSURE phase (with final rehabilitation) (18 months).

H = offset implementation and operational phase (in PERPETUITY).

Table 2: Stakeholder participation plan

Name of stakeholder group*	Interest	Key stages for engagement and timing
Non-governmental organisations		
TEWSSA (Threatened Environment and Wildlife Society of South Africa)	Environment / biodiversity (nationwide organisation with a broad environmental and conservation mandate)	C, D, E, F, G Completion of Key Biodiversity Values Matrix (Step 4.2) Discuss application of the Thresholds Matrix (Step 5.2) Support research and compilation of BASELINE STUDIES (Step 4) Help evaluation offset options (Step 7)
eMakhata Plant Specialist Group	Plant species (local association of interested lay-people and professionals)	A, C, D, E, F, G, H Local knowledge input into above
TWT (Threatened Wildlife Trust)	Environment / biodiversity (nationwide organisation that focuses on endangered species)	C, D, H
BirdersUnlimited	Bird species (international conservation NGO with local South African chapter)	C, D, H
Kwazulu Natal Farm & Conservancy Association	Conservancy Areas on farms (association of landowners for the voluntary conservation of biodiversity on private land holdings)	C, D, H
Agricultural Society of South Africa (ASSA)	Agriculture	C
GREAT (Gamebird Research and Education in Africa Trust)	Game birds and their conservation and sustainable use through improved habitat and population management (including wingshooting)	D, H
Letabeng Natural & Cultural Heritage Society	Natural and cultural heritage	A, C, D, E Pre-exploration and exploration phase – avoidance of archaeological and historical sites Operational phase – interested stakeholder if any artefacts are unearthed)
Governmental organisations		
Department of Agriculture	National department for agriculture, land care, extension and land redistribution	C
Department of Water	Water quality, water allocation, forestry and listed tree species.	C, E, F, G

Name of stakeholder group*	Interest	Key stages for engagement and timing
Department of Minerals and Mining	Mining of minerals and energy requirements	A, B, C, E, F, G
Department of the Environment	Environment and impacts on society	
South African National Foundation for Biodiversity	Biodiversity and environment	C, D, H
Kwazulu Natal Nature Conservation Agency	Biodiversity	B, C, D, H
Letabeng Local Municipality	Society and environment	C, D, E, F, G
Private and communal sector		
Mountain Timber & Sawmilling Company	Forestry (private company with plantation forestry holdings in the district)	C
NtabaManzi Community Trust (representative of a community of communal, mostly non-commercial, farmers)	Community organisation representing the NtabaManzi community (54 families on communal land adjacent to the development site)	C, D, H Short time involvement in phase E (mine development) to harvest those plant species of medicinal value that will be lost to development and that cannot be transplanted Long term loss of access to resources traditionally harvested by these neighbours of the development site
Letabeng landowners (commercial farmers)	Agriculture, tourism, environment (various private landowners (mostly farmers) and communal farmers	C, D, H
ThabaMvelo Traditional Healers Association	Traditional practitioners who use medicinal plants as well as plants of CULTURAL VALUE	C, D, H

* All stakeholders listed here are fictional. They are however modelled on existing organisations with similar interests and institutional setup in other parts of the country.

Step 3: Review regulatory or legal requirements for a biodiversity offset

This step involves a review of national as well as provincial legislation and policy, to determine whether or not biodiversity offset legislation and conservation and development plans exist to govern or guide the design and implementation of the offset. Developers should begin by identifying those government agencies that may have offset policies and regulations and accessing any existing legislation that pertains to biodiversity offsets. In the case of the Worked Example there is no specific offset legislation in force. However, the principle of offsets has previously been used in the Province by the Department of the Environmental and the Kwazulu Natal Nature Conservation Agency with regard to wetland losses by a coal mine. This previous instance did not however involve any quantification of losses and gains using a common biodiversity 'CURRENCY'.

In South Africa, the following legislation is relevant to the kaolin mine's biodiversity offset plans, although it does not explicitly state the need for an offset:

- EIA regulations under the National Environmental Management Act (Act 107 of 1998) – NEMA)

  NEMA is South Africa's overarching environmental statute. The Act emphasises the principle of cooperative GOVERNANCE and ensures that the environmental rights provided for in the Constitution are protected and fulfilled. It establishes a framework to implement the White Paper for Environmental Management Policy for South Africa. Although the Act requires the lead agent, the Department of Environmental Affairs and Tourism (DEAT), to ensure effective custodianship of the environment, it also acknowledges that the State alone is unlikely to be able to manage the environment effectively. The scope for public involvement in environmental management is provided for in the Act, which includes the ability to institute private prosecutions and gives the public the ability to participate in the management of the environment. Section 2(1) of Act sets out a range of environmental principles that are to be applied by all organs of state when taking decisions that significantly affect the environment. Amongst the key principles is that all development must be socially, economically and environmentally sustainable and that environmental management must place people and their needs at the foreground of its concerns, and serve their physical, psychological, cultural and social interests equitable. Chapter 45 of the Act outlines the principles of Integrated Environmental Management (IEM). IEM provides a framework for the integration of environmental issues into the planning, design, decision-making and implementation of plans and development proposals. The principles of IEM underlie the approach to this EIA. NEMA has repealed most of Environmental Conservation Act, No.73 of 1989.

  NEMA specifies the PRECAUTIONARY and POLLUTER PAYS PRINCIPLES which can be seen as supporting the use of biodiversity offsets.

- Environmental Conservation Act, No. 73 of 1989

  The Environment Conservation Act (ECA) was originally passed to provide for the effective protection and controlled utilisation of the environment. Although many of its provisions have since been repealed by the National Environmental Management Act No. 107 of 1998 (NEMA), the Environmental Conservation Act continues to play an important role. In particular, most environmental impact assessments are conducted under the ECA in accordance with the Environmental Impact Assessment Regulations, so it is relevant to biodiversity offsets as it governs MITIGATION of impacts and thus RESIDUAL IMPACTS to be offset.

- National Environmental Management: Biodiversity Act, No 10 of 2004

  The National Environmental Management: Biodiversity Act applies throughout the country and is intended to give effect to the Convention on Biodiversity and other international agreements affecting biodiversity that have been ratified by South Africa.

A policy on offsets has been compiled for the Western Cape Province, but this has not yet been translated into law and unless it is replicated throughout the country, would not apply in Kwazulu Natal.

In summary, the letter of the environmental laws does not make provision for offsets. However, in spirit one can read support for the principle. In practice, a number of offsets have been implemented by private developers. These offsets have been either up-front and voluntary (mostly motivated by the hope for an easier ride through the EIA process) or they have been in response to pressure from stakeholders. However, none of these offsets has gone through a systematic, stepwise qualification and quantification process similar to that used here to apply the BBOP principles.

Step 4: Determine the need for an offset based on residual adverse effects

The first part of this step is to identify biodiversity components occurring at the impact site.

It is important to understand which biodiversity components are of particular importance in the area affected by the project. This information can contribute to deciding on the basis for calculating the losses as a result of the Impact and GAINS from the offset, and to checking that an Offset designed to deliver NO NET LOSS of all the biodiversity affected definitely delivers gains for the KEY BIODIVERSITY COMPONENTs in the project area.

A 'Key Biodiversity Components Matrix' has been compiled that brings together the most important biodiversity elements and that explains their importance in the context of the Letabeng area.

The Letabeng area is very diverse. It would be unmanageable to try to deal with the full range of species and biodiversity components during the offset planning process. The challenge is in selecting a smaller subset of biodiversity components that adequately captures and characterises the specific character and diversity of the area. The components that have been selected for the Key Biodiversity Components Matrix are based on a combination of the following:

- List of species used for modelling purposes in the Provincial C-Plan. (C-Plan is a software package that assists with spatially-based decision-making by determining the relative importance of different areas in achieving certain conservation targets.);
- Bird species that are ENDEMIC to these grasslands and / or that are prime target species for the numerous birdwatchers that specially visit this area;
- Plant species that are localised and / or are important for traditional medicinal purposes;
- The main habitats to which these birds and plants are linked.

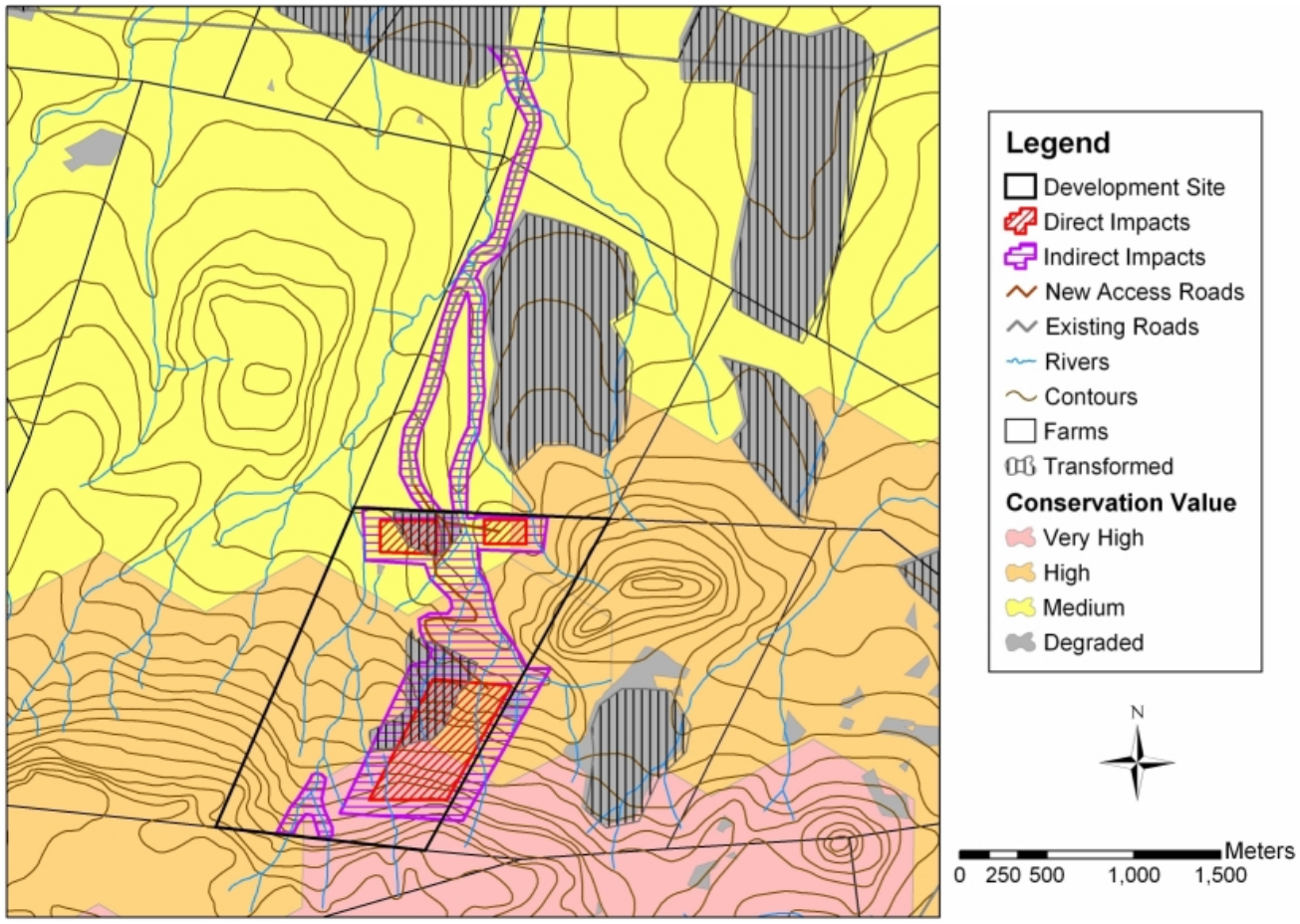
Table 3: Key Biodiversity Components Matrix

Biodiversity component	INTRINSIC VALUES	USE VALUES	CULTURAL VALUES
Species *Birds* • Rudd's Lark • Botha's Lark • Yellowbreasted Pipit • Blue Korhaan • Blue Crane • Grey Crowned Crane *Plants* • *Aloe modesta* • *Aloe kniphofoides* • *Watsonia latifolia* • *Eucomis montana* • *Alepidea amatymbica* *Mammals* • Oribi	• Near Threatened (*Aloe kniphofiodes, Eucomis montana, Watsonia latifolia*) • Vulnerable species (Yellow-breasted Pipit, Blue Korhaan, Blue Crane, Grey Crowned Crane, *Alepidea amatybica)* • Endangered species (Botha's Lark, Oribi, *Aloe modesta*) • Critically Endangered species (Rudd's Lark) Antelope species that is in decline throughout South Africa as a result of habitat loss, competition from livestock and illegal hunting (particularly using packs of dogs)	Tourism and LIVELIHOOD benefits: • It is an already well-established and rapidly growing birding destination that attracts national and international visitors and has fostered to a growing lodge and B&B local hospitality sector. Health and livelihood benefits: • Collection and sale of medicinal plants by traditional healers.	• Blue Crane is the National Bird of South Africa *Alepidea amatymbica* and *Eucomis montana* are used in traditional medicine. These species have traditionally been harvested on the impact site by the community living on the adjacent farm
Habitats • Letabeng montane grassland • Pindhela Moist Grassland • Northern Afrotemperate Forest	Least Threatened Vulnerable Least Threatened	Valued by local people for: • Landscape aesthetics • Resource base for the agricultural use of the area (sheep and cattle farming) • Suitable for afforestation	A rich history and culture ranging from Bushmen Rock Art to Anglo-Boer war encampments and blockhouses
Ecosystem services • Water catchment • Fire patterns • Migration routes (Altitudinal and latitudinal migrants)	Major processes necessary for the maintenance of a healthy ecosystem and the support of several species and habitats. Forms part of migration routes for altitudinal and latitudinal migrant species. Montane grassland is fire dependent, for example	The grasslands and wetlands performs the following functions: • Water catchment • Base flow regulation • Flood attenuation • Water runoff from the project area feeds several dams whose water is used for the cooling down of electricity generating plants	Medicinal plant species have traditionally been harvested on the Impact site by the community living on the adjacent farm

The conservation importance of the study area is depicted in Map 3. This information is based on a Provincial conservation planning exercise that was undertaken by the Kwazulu Natal Nature Conservation Agency during 2006. The INDIRECT IMPACT that extends in a northerly direction along the western border of the neighbouring farm indicates an increased likelihood of increased sediment loads in the drainage lines as a

result of loss of cover due to the mining operations, increased road network, buildings etc. This is likely to have a negative effect on the fly-fishing operations offered by the owners of the farms downstream of the impact site. Much of this indirect impact would be difficult to offset. It thus becomes essential to avoid and mitigate this impact. Sediment loads can be controlled through good mining practices including the provision of settling ponds.

Map 3: Conservation importance (pre-impact)



Step 4: Determine the need for an offset based on residual adverse effects (continued)

An important stage in determining the need for an offset is to assess the potential significance of the project's impacts on biodiversity and apply the MITIGATION HIERARCHY. The second part of Step 4 lists the potential project impacts on the biodiversity components of conservation significance that were identified in the previous step. In the following table, the biodiversity components that are likely to be negatively affected are first identified. Their relative value and the way they will be affected are determined. The mitigation hierarchy is applied in order to highlight which impact can neither be avoided nor mitigated, thereby requiring offsetting.

Table 4: Potential project impacts on the key biodiversity components

BIODIVERSITY ASSESSMENT									IMPACT ASSESSMENT			MITIGATION HIERARCHY				
Biodiversity component	SIGNIFICANCE			IRREPLACEABILITY			Cultural values	USE VALUES	Project activity	Likely PRIMARY IMPACTS	Likely Secondary / CUMULATIVE IMPACTS	Avoid	Mitigate	Offset	AVOIDANCE or mitigation strategy	IN-KIND restriction on offset? (Y / N)
	Global	National	Local	Site endemic	Localised	Wide-spread										
Species																
Bird species																
Rudd's Lark	Cr.En.	Cr. En. Endemic, IBA	Very Important Conservation Areas		X			Indirect: flag-ship birding species	Construction and operation	Scare species from impact site and surrounding				X		Y
Botha's Lark	En.	En. Endemic, IBA	Very Important Conservation Areas		X				Construction and operation	Scare species from impact site and surrounding				X		Y
Yellow-breasted Pipit	VU	VU. Endemic, IBA	Very Important Conservation Areas		X			Indirect: flag-ship birding species	Construction and operation	Scare species from impact site and surrounding				X		Y
Blue Korhaan	VU	VU Endemic, IBA	Very Important Conservation Areas		X		X		Construction and operation	Scare species from impact site and surrounding				X		Y
Grey Crowned Crane	VU	VU, IBA	Important Conservation Areas			X			Construction and operation	Scare species from impact site and construction and operation surrounding				X		Y
Blue Crane	VU	VU, IBA	Important Conservation Areas			X	National Bird		Construction and operation	Scare species from impact site and surroundings				X		Y

BIODIVERSITY ASSESSMENT									IMPACT ASSESSMENT			MITIGATION HIERARCHY				
Biodiversity component	SIGNIFICANCE			IRREPLACEABILITY			Cultural values	USE VALUES	Project activity	Likely PRIMARY IMPACTS	Likely Secondary / CUMULATIVE IMPACTS	Avoid	Mitigate	Offset	AVOIDANCE or mitigation strategy	IN-KIND restriction on offset? (Y / N)
	Global	National	Local	Site endemic	Localised	Wide-spread										
Plant species																
Aloe modesta	En	Red Data Species	Very Important Conservation Areas		X				Construction and operation	Removal at impact site			X		Plant rescue and re-establishment	
Aloe kniphofoides	NT	Red Data Species	Important Conservation Areas		X				Construction and operation	Removal at impact site			X		Plant rescue and re-establishment	
Alepidea amatymbica	VU	Red Data Species	Important Conservation Areas			X		Medicinal plant	Construction and operation	Removal at impact site	Increased access to muti collectors		X		Plant rescue and re-establishment	
Eucomis montana	NT	Red Data Species	Important Conservation Areas		X		X	Medicinal plant	Construction and operation	Removal at impact site	Increased access to muti collectors		X		Plant rescue and re-establishment	
Watsonia latifolia	NT	Red Data Species	Important Conservation Areas		X				Construction and operation	Removal at impact site			X		Plant rescue and re-establishment	
Mammal species																
Oribi	En	Red Data Species	Important Conservation Areas		X				Construction and operation	Scare species from impact site and surrounding	Reduced presence along transport route. In-creased access to poaching			X		Y
Habitats																
Letabeng montane grassland		Least threatened			X		X	Grazing	Construction and operation	Habitat loss	Increased fire frequency and grazing			X		Y
Phindela Moist Grassland		Vulnerable			X			Grazing	Construction and operation	Habitat loss	Increased fire frequency and grazing			X		Y
Northern Afro-temperate Forest		Least threatened				X			Construction and operation	Habitat loss	Increased access to forest resources			X		Y
Ecosystem services																
Water catchment		Important source of water for power stations	Important source of water locally		X			X	Construction and operation	Habitat Loss and loss of water quality and quantity	Loss of water quality and seasonality of flow downstream of project			X		Y

BIODIVERSITY ASSESSMENT									IMPACT ASSESSMENT			MITIGATION HIERARCHY				
Biodiversity component	SIGNIFICANCE			IRREPLACEABILITY			Cultural values	USE VALUES	Project activity	Likely PRIMARY IMPACTS	Likely Secondary / CUMULATIVE IMPACTS	Avoid	Mitigate	Offset	AVOIDANCE or mitigation strategy	IN-KIND restriction on offset? (Y / N)
	Global	National	Local	Site endemic	Localised	Wide-spread										
Fire patterns		Maintain health of system to support other processes and species	Maintenance of species diversity for local tourism and for local cattle and sheep farming		X		X		Construction and operation	Habitat loss and increased fire frequency	Increased fire frequency in surrounding areas due to fire spread			X		Y
Migration routes (altitudinal and latitudinal migrants)		Maintain local and migrant species, important in maintaining other ecosystem processes.	Important for local tourism		X				Construction and operation	Loss of habitat and disturbance of migration routes.				X		Y

Step 5: Quantify the kaolin mine's residual impact on biodiversity

In **Step 5**, a decision must be made on the METRICS to be used to measure the loss of biodiversity caused by the proposed development and the potential gains offered through the offset. The HABITAT HECTARES approach was selected for the Worked Example. However, as this approach focuses solely on habitat it may not sufficiently capture the potential losses resulting from FRAGMENTATION, increased edge effects, road kills etc with respect to a few particular species. Therefore a supplementary method based on 'Species occupancy' was also applied to these species so the results could be taken into consideration when defining the scale, nature and location of the offset activities.

Method 1 – habitat hectares approach

The Key Biodiversity Components Matrix (see **Step 4**) catalogued the most important biodiversity components (species, habitats and ecological processes) at the impact site. Consideration of these KEY BIODIVERSITY COMPONENTS can help in the selection of a shorter list of 'BENCHMARK components and related ATTRIBUTES' that together describe the overall biodiversity makeup (see Table 5). The benchmark components do not simply represent a shortened version of the key biodiversity components. Rather, the benchmark components lead to the identification of attributes that are used to quantify the current and future state of biodiversity in each habitat (see habitat hectares matrix – Table 8, below).

In this instance, for example, the pattern of short and tall indigenous grassland would be a critical attribute that relates to grassland bird diversity and to the survival of the endemic larks. Such an attribute could function as a PROXY for a number of biodiversity components and functions (in this example, bird diversity, oribi density, water catchment role with good regulation of base flow, capacity to withstand invasion from alien weeds, etc).

Table 5: Benchmark components and related attributes

Biodiversity component	BIODIVERSITY ASSESSMENT								Habitat types	Attribute
	Intrinsic, 'non-use' Values						USE VALUES			
	VULNERABILITY			IRREPLACEABILITY			Socioeconomic values	Cultural values		
	Global	National	Local	Site endemic	Localised	Wide-spread				
Species										
Rudd's Lark	Cr. En.	Cr. En. Endemic, IBA	Very Important Conservation Areas		X			Indirect: flagship birding species	Grassland	Short, dense grass cover (>80% cover, avg inter-tuft distance <50 mm, elevation > 1,800 m)
Botha's Lark	En.	En. Endemic, IBA	Very Important Conservation Areas		X				Grassland	Short, heavily grazed grassland (<1,200 kg phytomass / ha)
Yellow-breasted Pipit	VU	VU. Endemic, IBA	Very Important Conservation Areas		X			Indirect: flagship birding species	Grassland	Lush grassland, high altitude, flat to gently sloping (>80% cover, avg inter-tuft distance <50 mm, elevation > 1,800 m, slope <10%)

Biodiversity component	BIODIVERSITY ASSESSMENT								Habitat types	Attribute
	Intrinsic, 'non-use' Values						USE VALUES			
	VULNERABILITY			IRREPLACEABILITY			Socioeconomic values	Cultural values		
	Global	National	Local	Site endemic	Localised	Wide-spread				
Habitats										
Letabeng Montane Grassland		Least threatened			X		Local ECOTOURISM, 'battlesfield' tourism Healing power of medicinal plants, financial value on informal market	A rich history and culture ranging from Bushmen Rock Art to Anglo-Boer war encampments and blockhouses; Plant species of magic and medicinal value in traditional Zulu culture	Grassland	Grassland cover, species diversity Size of rock paintings, accessibility, condition Density and accessibility of medicinal plants
Pindhela Moist Grassland		Vulnerable			X		Local ecotourism, 'battlesfield' tourism	A rich history and culture ranging from Bushmen Rock Art to Anglo-Boer war encampments and blockhouses	Grassland	Grassland cover, species diversity Size of rock paintings, accessibility, condition Density and accessibility of medicinal plants
Northern Afro-temperate Forest		Least threatened				X			Forest	Closed canopy forest, old growth. Patch size, age structure. Medicinal species (bark) – density and size of stems
Water catchment		Important source of water for Power Stations and Commercial and Industrial Hub of South Africa	Primary water source for local households		X	X	X		Grassland	Grassland cover, wetland extent and condition
Fire patterns		Maintain health of system to support other processes and species	Quality and quantity of grazing for livestock		X				Grassland	Phytomass
Migration routes (Altitudinal and latitudinal migrants)		Maintain local and migrant species, important in maintaining other ecosystem processes.	Important for local birding tourism		X				Grassland	Grassland cover

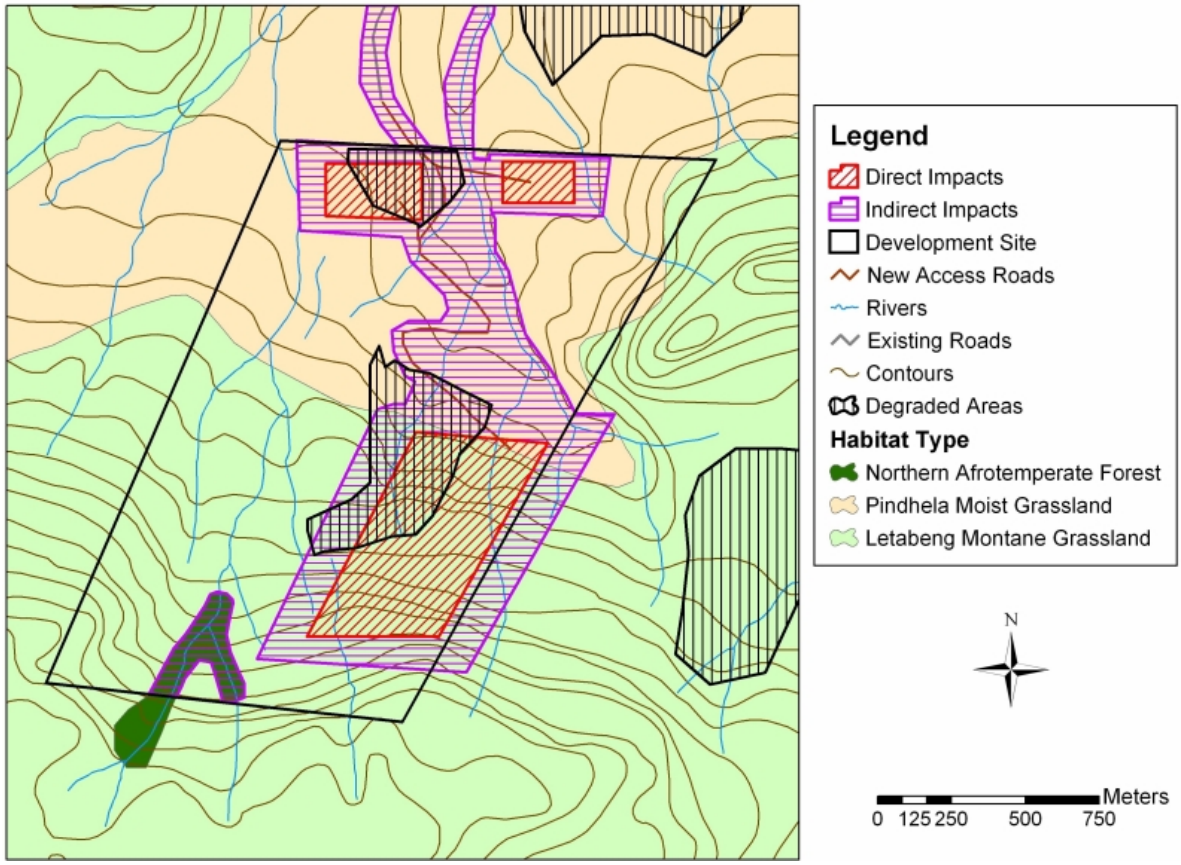
The pre-impact CONDITION of the impact area has an important bearing on the level of biodiversity that will be lost through the development. In this instance, most of the habitat is in a good condition (see Table 6 and Map 4).

Table 6: Pre-impact condition of impact area

Habitat of impact area	Total extent (ha)	Extent in good condition (ha)	Extent in poor condition (ha)
Letabeng Montane Grassland	58.3	49.5	8.8
Pindhela Moist Grassland	95	70	25
Northern Afrotemperate Forest	5.4	5.4	0.0

Map 4: Pre-impact condition of site

The different habitats are generally in good condition, with the exception of the previously cultivated area in the north and some degraded areas in the middle of the property as a result of overgrazing and alien plant invasion.



The respective extent of pre-impact good and poor condition of each habitat is used to calculate a weighted score for each habitat (see following table for the Pindhela Moist Grassland). This score is used as input in column **F** of the habitat hectares matrix table (Table 8).

Table 7: Weighted scores for four attributes of Pindhela Moist Grassland

	Hectares of habitat	Hectares in good condition	Hectares in poor condition	Pre-project condition in good condition habitat	Pre-project condition in poor condition habitat	Good condition habitat ha* condition score	Poor condition habitat ha* condition score	Sum of habitat ha* scores	Weighted score (sum of habitat divided by total habitat size)
Pindhela Moist Grassland	95	70	25	9	7	630	175	805	8
	95	70	25	9	5	630	125	755	8
	95	70	25	8	4	560	100	660	7
	95	70	25	8	2	560	50	610	6

Input used in Habitat Hectares Matrix table (Column F)

The 'benchmark components and attributes' table compiled earlier (Table 5) was used to derive a parsimonious set of attributes (Column **B** in the habitat hectares matrix table below) that characterise the biodiversity of each habitat (Column **A**). The CONDITION of each attribute was scored for the benchmark site (on a relative scale of 1 to 10) (Column **C**). The different attributes are weighted relative to each other in terms of their importance in characterising the habitat's biodiversity (Column **D**). The extent of the different habitats is listed in Column **E**. The pre-project condition (Column **F**) is a WEIGHTING based on the relative extent that was in a good and in a poor condition respectively (see previous table for input). The pre-project extent in habitat hectares (Column **G**) is calculated as the ratio of the pre-project condition to the benchmark condition multiplied by the rating for the attribute multiplied by the extent of the habitat. The expected condition of the habitat after the impact is given in column **H**. In this example, it is expected that the original vegetation cover will be totally removed by the mining operation resulting in a nil '0' score remaining. The post-project remaining habitat hectares (Column **I**) are calculated as the ratio of the post-project condition to the benchmark condition multiplied by the rating for the attribute multiplied by the extent of the habitat. Finally, the amount of habitat hectares lost (Column **J**) is arrived at by subtracting the remaining post-project extent in habitat hectares from the original extent in habitat hectares.

Table 8: Habitat hectares matrix table

BENCHMARKING				IMPACT SITE ASSESSMENT					
Habitat types (A)	Attribute (B)	Bench-mark condition / level (C)	Weighting (D)	# hectares of habitat type (E)	Pre-project condition (F)	Pre-project habitat hectares (G) (F/C*D)*E	Post-project condition (H)	Post-project habitat hectares (I) (H/C*D)*E	Habitat hectares lost (J) (G-I)
Letabeng Montane Grassland	Ground cover	10	0.30	58.3	9	15.7	0	0.0	15.7
	Species diversity	10	0.30	58.3	8	14.0	2	3.5	10.5
	Alien vegetation	10	0.20	58.3	8	9.3	4	4.7	4.7
	Erosion	10	0.20	58.3	8	9.3	4	4.7	4.7
Total						**48.4**		**12.8**	**35.6**
Pindhela Moist Grassland	Ground cover	10	0.30	95	8	22.8	0	0.0	22.8
	Species diversity	10	0.30	95	8	22.8	2	5.7	17.1
	Alien vegetation	9	0.20	95	7	14.8	4	8.4	6.3
	Erosion	9	0.20	95	6	12.7	4	8.4	4.2
Total						**73**		**22.5**	**50.5**
Northern Afro-temperate Forest	Canopy cover	10	0.30	5.4	9	1.45	8	1.30	0.16
	Age structure	10	0.30	5.4	9	1.46	8	1.30	0.16
	Alien vegetation	9	0.10	5.4	8	0.48	7	0.42	0.06
	Presence of canopy species preferentially cut for timber	9	0.30	5.4	9	1.62	7	1.26	0.36
Total						**5.0**		**4.3**	**0.7**
								TOTAL HABITAT HECTARES LOST	**86.7**

The habitat hectares matrix table is now summarised for each habitat, as shown in Table 9.

Table 9: Project impact – summarised

Habitat types	Actual project area (ha)	Good condition (ha)	Poor condition (ha)	Pre-project habitat hectares	Post-project habitat hectares*	Habitat hectares lost
Letabeng Montane Grassland	58.3	49.5	8.8	48.4	12.8	35.6
Pindhela Moist Grassland	95	70	25	73.0	22.5	50.5
Northern Afrotemperate Forest	5.4	5.4	0.0	5.0	4.3	0.7
TOTAL				**126.4**	**25.0**	**86.7**

* Note: Without proper rehabilitation, the direct impact figures would be greater, as the areas directly affected would be lost completely, and the post-project habitat hectares would be less.

The last column in the above table provides the total amount in habitat hectares that need to be offset for each habitat in order to achieve a 'no net loss' in biodiversity.

Method 2 – Species Occupancy approach

The fate of individual species of particular conservation value may not necessarily receive sufficient attention within the habitat hectares method. The effects of fragmentation and / or the reduction of a habitat below a certain threshold may have a disproportionately large negative impact.

The 'Species Occupancy' approach is used here as a supplementary method to evaluate the impact of the proposed development and to compare this to the benefits generated through the proposed offset.

This approach is illustrated here for two of the most important bird species, namely the Rudd's Lark and the Yellowbreasted Pipit that are found in the Letabeng Montane Grassland habitat.

Yellowbreasted Pipit

This endangered ENDEMIC species is biome and range-restricted, and a resident found in high-altitude grasslands above 1,400 m above sea level. The distribution is scattered. The Yellowbreasted Pipit has specialised breeding habitat requirements. The breeding range is restricted to a certain range of altitudes and to flat or gently rolling lush montane to sub-montane grassland. Based on species modelling, the suitable habitat covers 153,308 ha. Of this, based on direct observations, a total of 45,726 ha is currently occupied by the species. Total population is estimated at 2,500 to 6,500 birds. Densities are 0.14 $\pm$ 0.13 birds / ha in heavily grazed grasslands to 0.65 $\pm$ 0.20 birds / ha in lightly grazed grasslands.

On the impact site there will be a loss of nearly 60 ha of high montane grasslands (using the absolute area rather than the lower figure of 35 habitat hectares to allow for the fact that although some habitat will remain the overall disturbance may just be too high for pipits to survive). These 60 ha are virtually split evenly in terms of good and poor condition. The good condition relates to ground cover and length of grass – thus assuming good habitat equating with high densities of pipits. The converse would apply for the poor condition area.

Rudd's Lark

This species is endemic to South Africa. It is a biome and range-restricted resident. The distribution is fragmented and restricted to high-altitude montane grasslands. It prefers short grassveld on level areas e.g. hill tops and ridges without rocks. Threats involve habitat destruction (e.g. through afforestation) and grassland fragmentation, mismanagement practices e.g. serious overgrazing and trampling, burning regimes followed by intensive grazing and trampling and mining. Based on species modelling, the suitable habitat covers 226,664 ha. Of this, based on direct observations, a total of 53,518 ha is currently occupied by the species. Total population is estimated at less than 5,000 birds. Observed densities range from 0.07 to 1.2 birds / ha.

Species Occupancy methodology

The Species Occupancy method calculates an SBL (Susceptibility to Biodiversity Loss) index that is a continuous measure of THREAT STATUS (instead of IUCN RED LIST category) which is based on habitat loss and population depletion (or community degradation). An Excel spreadsheet provides a template for the calculation, enabling the user to identify what spatial extent and intensity of conservation management is required to fully offset biodiversity loss caused by the development project. Input data can be supplied at any level of sophistication, from local expert opinion to detailed systematic regional scale inventory (Dr Theo Stephens, New Zealand's Department of Conservation). The assessment as to whether or not there is a net gain or loss to the PERSISTENCE of the biota listed is based on change in this index.

This approach can offer effective ways of quantifying losses with respect to species, provided that detailed information on population parameters are available, or that sufficient time and resources are available for OFFSET PLANNERS to collect them. Where these conditions are not met, an alternative approach may be to use estimates of population size, density or relative abundance as proxies for likelihood of persistence of individual populations, following the rationale that larger (or denser) populations are, all things being equal, less likely to go extinct over a given timescale than smaller (or less dense) populations, provided they remain within the carrying capacity of the ECOSYSTEM. There are various methods of measuring the size, density or relative abundance of species populations. Whichever method is selected for a particular population, the need for repeated sampling (ideally over a period of at least 5 years) should be borne in mind, in order to account for cyclical and stochastic changes in species populations, which can seriously distort estimates based on single samples.

The requirement for (ideally) sophisticated data presents a problem considering the much shorter timeframes for planning and decision-making often associated with development projects.

Reasonably good data exist for the Rudd's Lark and Yellowbreasted Pipit. Some of the assumptions in the spreadsheet calculations have been varied to explore the sensitivity of the approach to imperfect data.

Results are presented in Table 10. The actual spreadsheet is much more complex. For the sake of presentation a number of columns have been omitted. These contain for example area and abundance scaling parameters to which certain default values have been applied.

Big negative numbers in the SBL gain / loss column indicate a large negative impact of the development. Positive numbers indicate a gain / enhancement. In this instance, only a limited negative impact is experienced.

Table 10: Species Occupancy results

Species	PRE-PROJECT			PROJECT IMPACT			
	Area (ha) potentially occupied	Area (ha) currently occupied	Total SBL	Project site habitat area (ha)	Post-impact habitat area	Total post-impact SBL	SBL gain / loss
Rudd's Lark	**226,664**	**53,518**	2.0125	**58.3**	53,518.0	2.0128	-0.0003
Yellowbreasted Pipit	**153,308**	**45,726**	1.5590	**58.3**	45,726.0	1.5592	-0.0003

The results from this table will be used as input to evaluate the offset GAINS in Step 8.

Step 6: Develop a shortlist of potential offset sites

The biodiversity that will be lost at the impact site was defined and quantified in Steps 4 and 5. The next step of the offset design process entails determining which sites within the area of interest have a reasonable potential to provide an equivalent or greater level of biodiversity based on the components identified as essential to the offset in Step 4 and the attributes identified in Step 5, as well as taking into consideration use and CULTURAL VALUES of local stakeholders to select the final package of offset activities and locations.

The total habitat hectares that will be lost through the new kaolin mine is 88.6 habitat hectares that is made up of three different habitats (Step 5).

The selection of a suitable offset site is greatly influenced by the landownership patterns in the surrounding area. The basic unit of a land parcel in the area is the 'farm'. Land ownership is linked to 'farms'. In terms of South African law, the subdivision of these basic cadastral units requires due process. Farms are blocks of varying size, with rectangular, triangular or parallelogram shape. Boundaries are generally determined by straight lines that link high points in the landscape. The 'farms' therefore mostly do not represent homogeneous ecological units, but they cut across elevation gradients. From a practical point of view, one thus has to use these cadastral units as point of departure for the selection of offset sites. The implication is that a single farm will generally over- or under-represent the required habitats and may include habitat that is not required. The 'farm' needs to be considered as a 'package' since sub-division along ecological lines is generally unfeasible.

Within the project area (Map 1), all farms that simultaneously harbour the two main HABITAT TYPES (Letabeng Montane Grassland and Pindhela Moist Grassland) were selected. From a functional and management point of view it is desirable to avoid offsets that consist of numerous very small land parcels. The basic unit used in the Provincial conservation planning exercise that was undertaken during 2006 was a hexagonal polygon that was 118 ha in size. This unit size of 118 ha was thus selected as the minimum size for a farm to be considered for the candidate offset list.

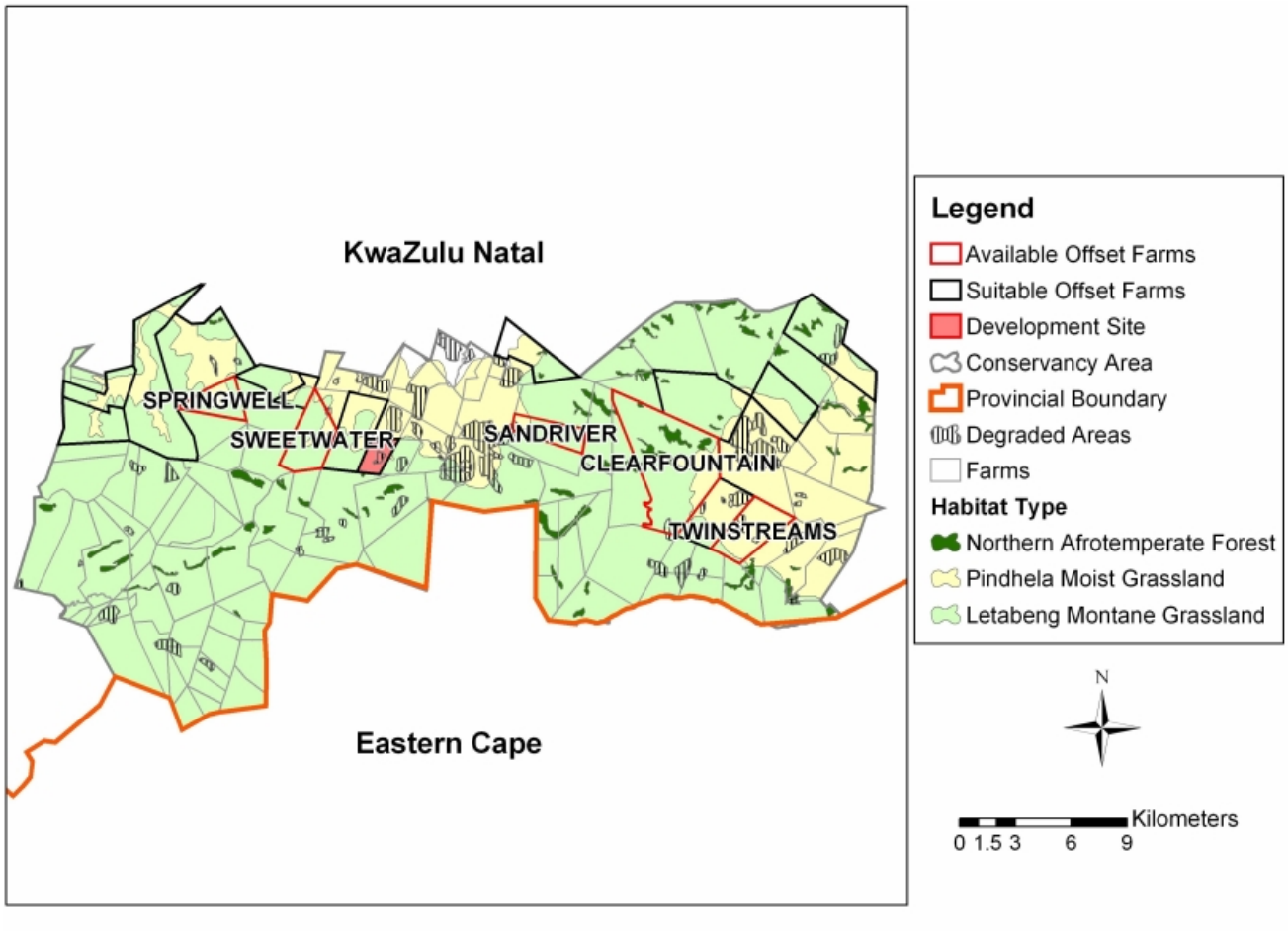
The list of POTENTIAL OFFSET SITES comprises 22 farms that exceed 118 ha in size and that contain both the two main habitats. Of these 22 farms, only four are on the market at present (Maps 5 and 6). A fifth farm (Clearfountain) has already been acquired by the Provincial conservation authorities. It is however, poorly protected and managed at this stage. It may offer opportunities for OUT-OF-KIND or trading-up offsets. These five properties thus offer a short list of promising potential offset sites. The size of the available farms and their habitats is presented in Table 11.

Table 11: Size of available farms and their habitats

Habitat	Potential offset farms (sizes in ha)				
	Sweetwater[1]	Sandriver[1]	Twinstreams[1]	Springwell[1]	Clearfountain[2]
Letabeng Montane Grassland	459	366	157	330	1,828
Pindhela Moist Grassland	276	66	588	125	408
Afrotemperate Forest	0	0	11	0	191
Total	**735**	**432**	**756**	**455**	**2,427**

[1] Available on the open market.
[2] Already acquired by the Provincial conservation authorities.

Map 5: Potential offset localities



Note: Clearfountain is an area already acquired by the conservation authorities, but it is poorly managed.

Step 7: Select appropriate offset site(s) and calculate offset gains

The next step is to identify which of the options on the shortlist is (or are) the most appropriate for the offset. This process involves comparing them for the required biodiversity ATTRIBUTES, as well as considering whether an offset there is likely to be feasible and succeed in practical terms, for social and legal reasons. Their geographical location and contribution in terms of conservation planning priorities is compared. Their ECOSYSTEM SERVICES delivery and associated socioeconomic benefits comes into play. Each option is also checked for its practical feasibility.

The potential offset farms were assessed as to which of the key biodiversity components present at the impact site are represented on them. The following table demonstrates that out of the four available candidate offset sites, Sweetwater, Sandriver and Twinstreams harbour a much wider suite of the important components compared to Springwell. The latter was thus discarded.

Table 12: Prospective offset site comparison table

BIODIVERSITY ASSESSMENT	OFFSET TYPE		SITE SELECTION				
Biodiversity Component	IN-KIND	Out-of-kind	*Site 1* Spring-well	*Site 2* Sweet-water	*Site 3* Sand-river	*Site 4* Twin-stream	Clearfountain (owned by conservation authorities)
Species							
Birds							
Rudd's Lark	Y			Y	Y	Y	Y
Botha's Lark	Y		Y	Y		Y	Y
Yellowbreasted Pipit	Y			Y	Y	Y	Y
Blue Korhaan	Y		Y	Y		Y	
Grey Crowned Crane	Y		Y				Y
Blue Crane	Y		Y	Y		Y	
Plants							
Aloe modesta	Y				Y	Y	Y
Aloe kniphofoides	Y				Y	Y	Y
Alepidea amatymbica	Y		Y	Y		Y	Y
Eucomis montana	Y			Y	Y	Y	Y
Watsonia latifolia	Y			Y	Y	Y	
Mammals							
Oribi	Y					Y	

Habitats							
Letabeng Montane Grassland	Y		Y	Y	Y	Y	Y
Pindhela Moist Grassland	Y		Y	Y	Y	Y	Y
Northern Afrotemperate Forest	Y						Y
Ecosystem Services							
Water catchment	Y		Y	Y	Y	Y	Y
Fire patterns	Y		Y	Y	Y	Y	
Migration routes (altitudinal)	Y			Y	Y	Y	Y
Cultural values – species, habitats, etc							
A rich history & culture (Bushmen Rock Art to Anglo-Boer war encampments and blockhouses)	Y				Y		
Plant species of magic and medicinal value in Zulu culture				Y	Y	Y	Y

Potential offset gains for each of the three remaining candidate offset sites

In the same way as for the impact area, the habitat hectares that are currently present at the potential offset sites as well as the potential gains through improved management were calculated for the three remaining potential offset sites.

The three potential sites are currently used for livestock grazing. Very little of the land has been converted and most of the original habitat persists. However, several of the attributes achieve a much lower score compared to the BENCHMARK reference level as the sites are overgrazed and alien invasive plants are becoming well established (*Acacia mearnsii, Pinus* spp., *Rubus* spp.). The management interventions that could result in improved scores for some of the attributes would be a reduced stocking rate, the active control of invasive alien plants and access control to prevent damage from uncontrolled off-road driving and the illegal harvesting of natural resources.

In this Worked Example the aspect of 'AVERTED RISK' is not considered, because there is little change anticipated in the short to medium term in the current pattern of land use. If anything, most livestock farmers are looking at incorporating biodiversity related activities into their enterprise (bird watching and fly fishing) for example, so there is no significant risk of habitat conversion.

For the sake of the Worked Example, the habitat hectares gain calculation for Sweetwater alone (and not for the other two farms) is illustrated by means of a comprehensive table. The calculation follows the same format as those for the habitat hectares matrix for the impact site (see Step 5). The differences are that Column **E** now lists the extent of the different habitats of the Offset candidate, Column **F** contains the pre-project condition and in Column **H** the post-project CONDITION is calculated. This post-project condition is expected to be higher as a result of positive management and protection actions. This is where a biodiversity gain can be attained as opposed to the BIODIVERSITY LOSSES following from lower conditions as a result of the development on the impact site. Finally, the amount of habitat hectares lost (Column **J**) is arrived at by subtracting original pre-project extent in habitat hectares from the higher post-project extent in habitat hectares.

Table 13: Habitat hectares matrix for the Sweetwater potential offset site

Benchmarking			Offset Site Assessment						
Habitat types (A)	Attribute (B)	Bench-mark condition / level (C)	Weighting (D)	# hectares where attribute occurs (E)	Pre-project condition (F)	Pre-project habitat hectares (G) (F/C*D)*E	Post-project condition (H)	Post-project habitat hectares (I) (H/C*D)*E	Habitat hectares gain (J) (I-G)
Letabeng Montane Grassland	Ground cover	10	0.30	459	7	96.4	8	110.2	13.8
	Species diversity	10	0.30	459	8	110.2	8	110.2	0
	Alien vegetation	10	0.20	459	6	55.1	8	73.4	18.4
	Erosion	10	0.20	459	5	45.9	7	64.3	18.4
Total						**307.5**		**358**	**50.5**
Pindhela Moist Grassland	Ground cover	10	0.30	276	6	49.7	8	66.2	16.6
	Species diversity	10	0.30	276	7	58.0	8	66.2	8.3
	Alien vegetation	9	0.20	276	5	30.7	7	42.9	12.3
	Erosion	9	0.20	276	6	36.8	7	42.9	6.1
					Total	**175.1**		**218.3**	**43.2**

A similar calculation was made for the other two candidate offset farms. The components that would be conserved on each of the different candidate offset sites, the potential gains in habitat hectares, the required activities to realise the offset GAINS and the costs involved have been detailed for each of the different offset sites (Appendix). The habitat hectare results only are summarised in the following table for all three of the candidate farms. The potential gains can be compared to the required offset.

Table 14: Summary of potential gains at potential offset sites

Habitat	Potential gains in habitat hectares			Required offset (ha)
	Sweetwater	Sandriver	Twinstreams	
Letabeng Montane Grassland	50.5	40.3	17.3	35.5
Pindhela Moist Grassland	43.2	8.0	92.1	50.5
Northern Afrotemperate Forest	0	0	0.8	0.7

None of the three farms can alone offset sufficient habitat hectares for the two grassland habitats. The Sandriver farm would only contribute a very low 16% towards offsetting the loss of Pindhela Moist Grassland at the Impact site. The best offset for the grasslands is achieved by the Sweetwater farm (142% of required offset for Letabeng Montane Grassland and 83% of Pindhela Moist Grassland). The Twinstreams farm achieves respectively 48.7% and 182% for these grasslands. The Letabeng Montane Grassland however is considered the more important of the two grassland types. Twinstreams does achieve a full offset of the affected Afrotemperate Forest. However the loss of this forest on the impact site is very limited in terms of habitat hectares. It is also a vegetation type that is very stable in the region.

The Sweetwater farm is also located most closely to the impact site. It is thus a good logical choice as an offset. The one advantage of Twinstreams is that due to its being located next to the Clearfountain farm, a larger protected area could be achieved with benefits in terms of scale. However, some of the important key biodiversity values that the offset is seeking to replace concern loss of access to medicinal plant species by local healers. An offset site and activities that support sustainable harvesting of these species are an important part of the overall offset package. Twinstreams would be too far for the ThabaMvelo Traditional Healers Association to access for the collection of medicinal plants (Box 3), whereas Sweetwater is accessible to them and suitable for sustainable harvesting of the species concerned.

Offsetting the effects of the loss of grazing land for livestock on the NtabaManzi community is more difficult. The BIODIVERSITY CONSERVATION requirements for species such as the Rudd's lark, Yellowbreasted pipit and oribi antelope will not allow the high levels of grazing that are currently applied by the community (Box 4). Alternative approaches will be required (see Box 4 and the Biodiversity Offset Cost-Benefit Handbook – **www.forest-trends.org/biodiversityoffsetprogram/guidelines/cbh.pdf**).

The shortfall in offset of Afrotemperate Forest and Pindhela Moist Grassland must be addressed through other means. The acquisition of a second farm was not considered to be a viable proposition. This was mostly because it would require duplication of all the institutions and processes associated with the Sweetwater offset.

Interventions in support of the Provincial conservation authority on Clearfountain make more conservation sense. Clearfountain has 408 ha of Pindhela Moist Grassland and 191 ha of Northern Afrotemperate Forest. This farm, although officially owned by the Provincial conservation authorities, is not in a good condition. It has

basically being lying idle since it was acquired by the conservation authorities. There is no budget available for effective protection and management.

Illegal hunting has for example led to the demise of the oribi antelope (see prospective Offset Comparison table). Similarly, the fire frequency is too high due to the absence of firebreaks and the unhindered spread of fires from neighbouring properties. There are problems with invasive alien plant species. These can all be remedied.

Effective protection and management could result in the gains from Clearfountain shown in Table 15 (using the same calculation procedures as those performed earlier for Sweetwater).

Table 15: Potential gains from Clearfountain farm

Habitat	Extent of habitat (ha)	Potential gains (habitat hectares)
Letabeng Montane Grassland	1,828	201
Pindhela Moist Grassland	408	64
Northern Afrotemperate Forest	191	8

This would more than cater for the shortfall of Pindhela Moist Grassland and Northern Afrotemperate Forest.

Box 3: Socioeconomic benefits – access by traditional healers to medicinal plants

The ThabaMvelo Traditional Healers Association was identified as an important stakeholder early in the process. Its members have traditionally harvested medicinal plants from the impact area. Due to the loss of habitat from the mining site and the restricted access for safety reasons, members of the Association require an alternative source of plant material.

The potential offset farms Sweetwater and Twinstreams are privately owned. They have not been used by traditional healers in the past. They could provide a suitable alternative source of medicinal plants to the impact site. Table 12 indicates that Twinstreams holds more of the valuable medicinal species.

Members of the Association have pointed out that Twinstreams would be too far for them to access in practical terms. Sweetwater is next to the impact site and next to the NtabaManzi community from which the ThabaMvelo association hails.

The access to medicinal plants on the Sweetwater Offset would require the following:

In situ

- Assessment of current standing stocks (distribution, density, demography);
- Determination of sustainable harvest quotas (including suitable harvest methods);
- Associated range management measures (control of grazing levels and application of relevant fire regime);
- Design and implementation of an appropriate monitoring system.

Ex situ

- Establishment of a nursery to propagate those species not found on Sweetwater;
- Collection of source material from other farms (including Clearfountain in co-operation with the Conservation authorities).

Box 4: Offsetting the loss of grazing land by the NtabaManzi community

Prior to the proposed development of the kaolin mine, the NtabaManzi community grazed its livestock on their communally-owned land that covers 460 ha. In addition they have had informal access to the neighbouring farm on which the mine will now be developed. This farm is approximately 300 ha in size.

The development will result in the direct loss of grazing areas of approximately 160 ha. However, this loss of grazing resources is compounded by the need for a safety and security area around the mine. The community will lose access to a total of 220 ha in terms of grazing land. Eighty hectares of the original farm will, however, still remain accessible. The mining company now owns this land and access to these 80 hectares of grazing resource is regulated by them.

Currently, some 210 head of cattle and some 640 sheep are being grazed on the 760 ha available to the community (460 ha of communal land and 300 ha in the project area). A conversion to Animal Units (using metabolic values relative to a standard steer of 450 kg) yields the following stocking:

Species	Current number	Number of animals per Animal Unit	Animal Units	Stocking on 760 ha
Sheep	640	4.35	147	
Cattle	210	1.00	210	
Total			**357**	**2.13 ha / AU**

The loss of access to 220 ha in the project area translates to a loss of carrying capacity of 103 Animal Units (based on the current stocking).

The proposed offset area of Sweetwater is primarily aimed at addressing the direct biodiversity losses following from the kaolin mine development. It follows that the use of the offset area must be attuned first to the needs of BIODIVERSITY CONSERVATION and enhancement. Whilst livestock grazing is not incompatible with biodiversity conservation in the grasslands of the Letabeng district, the current stocking density by the community is too high. Several of the species listed in the Key Biodiversity Matrix require low stocking densities of livestock. This applies to the oribi antelope as well as to the two important bird species, the Yellow-breasted pipit and the Rudd's Lark.

An appropriate stocking for the area would be 8 ha per Animal Unit for the Pindhela Moist Grassland and 12 ha per Animal Unit for the Letabeng Montane Grasslands. The forests offer virtually no grazing. The Sweetwater offset would thus allow a total of 72 AU to be supported:

Habitat on Sweetwater farm	Extent (ha)	Recommended stocking (ha/AU)	Carrying capacity (AU)
Pindhela Moist Grassland	276	8	34
Letabeng Montane Grassland	459	12	38
Total	**735**		**72**

The available grazing for 72 Animal Units on Sweetwater does not fully offset the loss of grazing for 103 Animal Units due to the kaolin mine project.

The following alternative solutions could be applied to the shortfall:

- Provide access to grazing on the farm Clearfountain that is owned and managed by the Provincial

conservation authorities. However, this area is already stocked with larger indigenous herbivores such as zebra. This farm is also too far from the NtabaManzi community for practical purposes of access and control;

- Increase stocking rates on Sweetwater. This would be contrary to the primary objectives of offsetting the biodiversity impacts;
- Improving husbandry practices on the communal land to allow greater benefits (financial or in-kind) from the livestock due to a higher productivity and sales of a smaller herd of cattle or flock of sheep;
- Hiring additional grazing from one of the neighbouring commercial farmers. This coupled to training and capacity building could generate additional benefits to this community. The appropriate stocking density in a commercial context in the Letabeng district would be 4 to 5 ha per Animal Unit.

Evaluating the proposed offset for the critical species using the Species Occupancy method

The proposed Sweetwater offset which has 495 ha of Letabeng Montane Grassland that offers habitat to the two critical bird species (Rudd's lark and Yellowbreasted pipit) was used in the Species Occupancy method (see following table).

Two different scenarios were run with regard to the target offset condition, namely 0.4 or 0.95. This is the range of the average proportion of natural carrying capacity (K) that now occurs as a result of past & present human disturbances. For species, it is a measure of reduced density or biomass because of predators & competitors, FRAGMENTATION and habitat quality degradation. The bigger the target value, the more intensive (and costly) the conservation action will need to be.

A low offset target condition value of 0.4 is used in the first approximation. The target reflects that the strength of populations to be achieved at the offset is no better than the background regional average. With this result, there would be little additional difference for the birds because they would remain at the regional background condition level (0.4). The birds have plenty of mediocre condition habitat remaining (they have only lost around 65%). Protecting a larger area of mediocre habitat which they already occupy would not really help them much – unless it was managed into markedly better condition. If a high offset target condition value (here 0.95) is set, then a small offset area will make a big difference – especially if the regional background condition and / or the impact site condition are a lot lower.

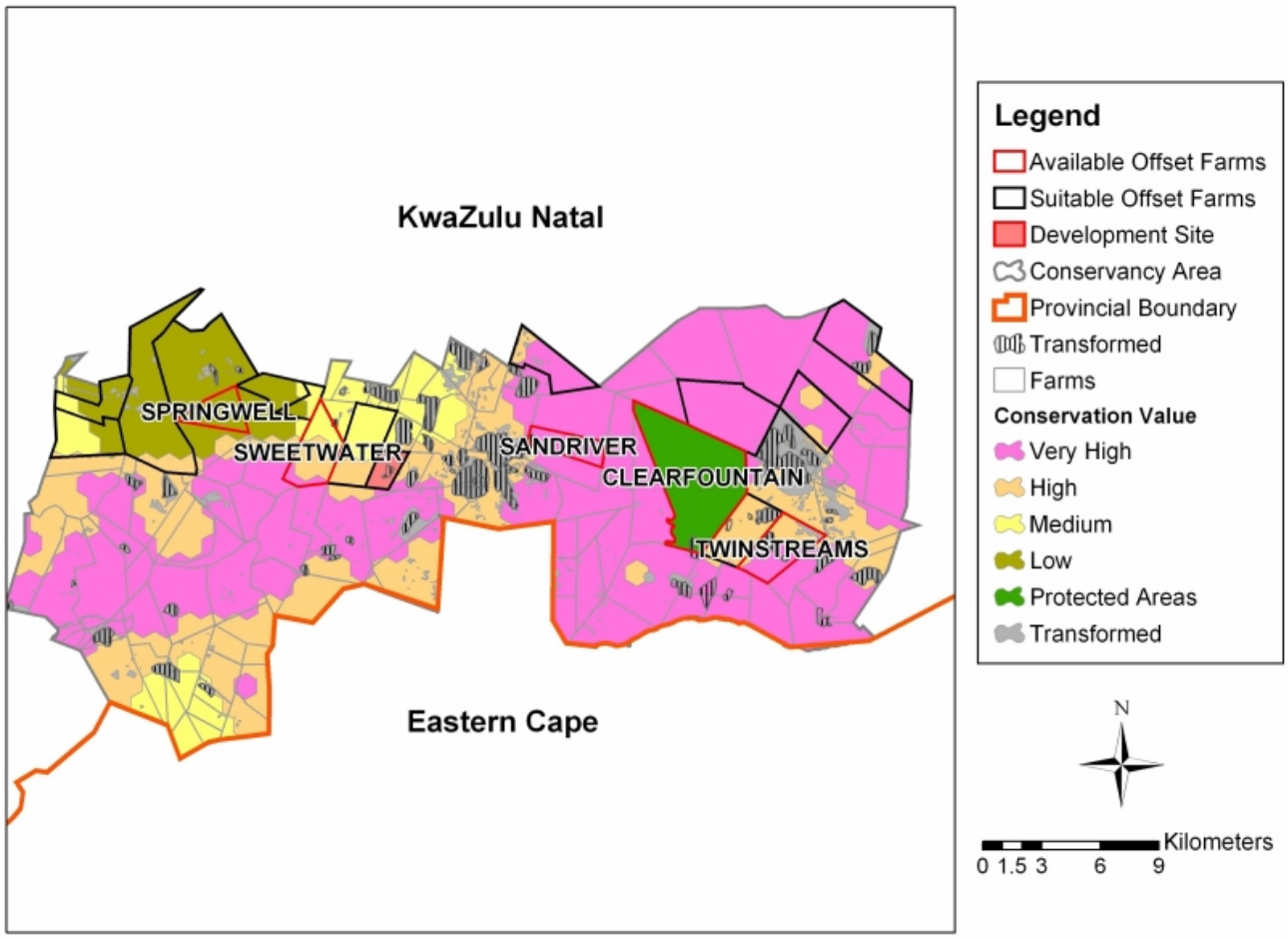
Table 16: Species Occupancy summary for two species

Species	PRE-PROJECT			PROJECT IMPACT				OFFSET			
	Area (ha) potentially occupied	*Area (ha) currently occupied*	*Total SBL*	*Project site habitat area (ha)*	*Post-impact habitat area*	*Total post-impact SBL*	*SBL gain / loss*	*Offset area (ha)*	*Target condition (fraction of K) in offset area*	*Total post-offset SBL*	*Total SBL gain / loss*
Lark	**226,664**	**53,518**	2.0125	**58.3**	53518.0	2.0128	-0.0003	**459**	**0.40**	2.0080	0.0045
Pipit	**153,308**	**45,726**	1.5590	**58.3**	45726.0	1.5592	-0.0003	**459**	**0.40**	1.5592	-0.0002
Lark	**226,664**	**53,518**	2.0125	**58.3**	53518.0	2.0128	-0.0003	**459**	**0.95**	1.9952	0.0173
Pipit	**153,308**	**45,726**	1.5590	**58.3**	45726.0	1.5592	-0.0003	**459**	**0.95**	1.5538	0.0052

The very small negative SBL value for the Yellowbreasted Pipit (using the target condition of 0.4) or the small positive SBL gains for both species indicate that the proposed Sweetwater offset is sufficient to offset any negative impact on those two species.

This appears to validate the results of the HABITAT HECTARES approach, namely that the areas of the selected offset sites should be sufficient in scale to secure 'NO NET LOSS' of two of the KEY BIODIVERSITY COMPONENTS considered, namely the lark and the pipit.

Map 6: Conservation value of potential offsets (from C-Plan conservation planning results for the Province)



Step 8: Define the activities for the biodiversity offset and their location

The selection of the most appropriate offset site is not the end of the process. Generally, a number of specific actions and activities will be required at the offset site to achieve the biodiversity gains that have been anticipated and to avert any biodiversity risks in the future. It is useful to capture a summary of the main features of the offset: its location, scale, the nature of the activities planned and groups involved. These are summarised below and in the Summary Table.

In conclusion, the required offset can be found IN-KIND, partly on Sweetwater (including access to medicinal plants for sustainable harvesting by local communities) and secondly through supporting activities on Clearfountain. The interventions on Clearfountain, although they do not involve acquiring the land, will support the conservation efforts of the Provincial organisation in a higher biodiversity priority area than the kaolin mine itself. The component of the offset on Clearfountain thus represents a kind of trading-up. Map 6 clearly illustrates the greater conservation value of the Clearfountain area compared, for example, to acquiring Twinstreams as part of the offset. The proposed offset therefore comprises work on Sweetwater and Clearfountain, as described in the Table 17.

The main activities for the Sweetwater offset site as well as the Clearfountain area managed by the Provincial authorities, would be as follows (also see the following table and photographs):

- Core offset activities to deliver measurable *in situ* CONSERVATION OUTCOMES:
  - Erect fencing to exclude stray livestock from surrounding agricultural properties and to restrain any re-introduced indigenous ungulates;
  - Reduce stocking rate through removal of livestock and replacement with low density of indigenous ungulates, including zebra, common reedbuck, oribi and mountain reedbuck;
  - Active control of alien plant species (primary control operation with annual follow-up operation);
  - Prevention of accelerated erosion and increased sediment yields through proper road alignment and reclamation of erosion gullies;
  - Active fire management with a shorter fire return period and a heterogeneous fire pattern both in time and space (a mosaic of short and longer grass is of particular value to the ENDEMIC larks);
  - Ensure permanent presence of rangers to deter illegal resource harvesting;
  - Rangers to control any marauding packs of domestic dogs (very serious impact on e.g. oribi and on ground-nesting endemic birds);
  - Provide access to Sweetwater for members of the ThabaMvelo Traditional Healers Association to gather medicinal plants, and work in partnership with them to determine and enforce sustainable harvest quotas of the medicinal plant species.
- Supporting activities:
  - Staff accommodation for law enforcement personnel;
  - Environmental education facility;
  - Support with management (fire fighting equipment, chainsaws and herbicides for alien plant control);
  - Funding of an independent ecologist for the setting up of a monitoring system and annual assessment;

– Support of an environmental education programme aimed at local schools (educational material, field visits, etc.);
– Training of local bird guides who can guide visiting bird watchers. BirdersUnlimited have already trained up a number of local guides that work in the Letabeng district guiding individual birders and organised groups. Additional guides can be recruited from the NtabaManzi community and trained to provide a guiding service on the offsets and on their own land. The kaolin mine could sponsor their attendance at the bird courses;
– Preferably source any labour from the neighbouring rural population in order to establish a stronger support for conservation, to provide alternative livelihoods to agriculture, and to minimise the risks of illegal exploitation of natural resources on the offset sites.

View on a portion of the Offset area. Note erosion gullies with invasive alien pine trees on the disturbed edges of the gullies. Appropriate management can address some of these problems.

Overgrazing of montane grassland on Clearfountain farm that is owned by the Provincial conservation authorities but that is without effective protection. Note illegal 4x4 track that is resulting in erosion. Appropriate protection can avoid some of these problems.

Table 17: Summary of the gains, costs and required activities which relate to the final proposed biodiversity offset

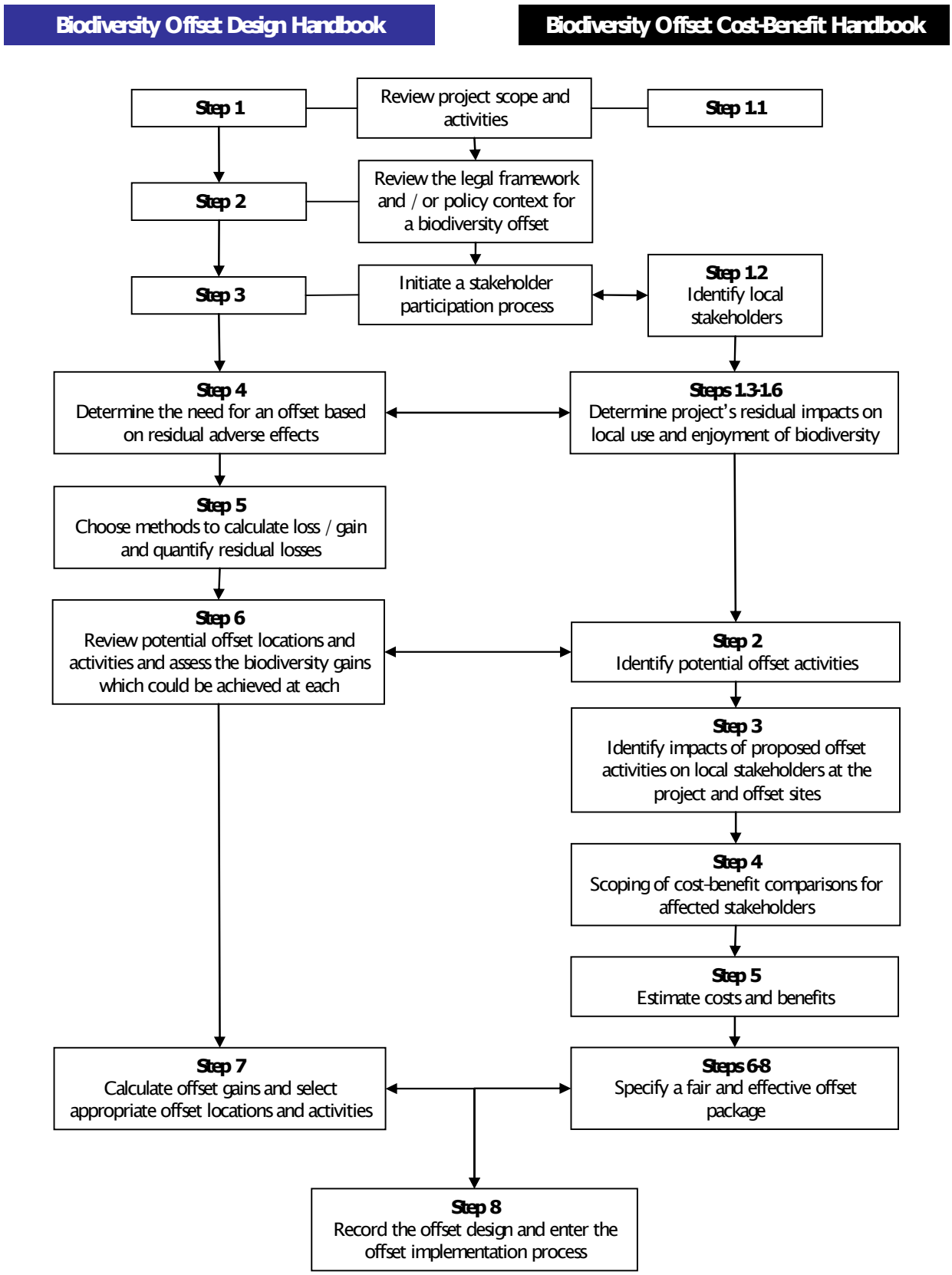
Desired outcomes	Activities	Rationale	Location	Components conserved	Predicted gains	Costs
Improved land management on: **Sweetwater**	Introduce fencing to exclude livestock Reduce stocking rate Active control of invasive alien plants Presence of rangers to deter illegal use Controlled access to grazing and medicinal plants for the NtabaManzi community	Raise conservation value of land by tackling underlying cause of loss, namely overstocking and invasive alien species Address some of the loss of access to 220 ha of grazing in the project area, which translates to a loss of 103 Animal Units. 72 animal units can be sustainably provided on Sweetwater	Sweetwater (see Map)	Letabeng Montane Grassland and Pindhela Moist Grassland, containing: Rudd's Lark, Botha's Lark, Yellowbreasted Pipit, Blue Crane, *Alepidea amatymbica, Watsonia latifolia* and medicinal plants protecting water catchment, fire patterns and migration routes	50.5 habitat hectares of Letabeng Montane Grassland 43.2 habitat hectares of Pindhela Moist Grassland	Annual budget to pay guards Annual budget to pay for labour to strip out invasive alien plants Funds to purchase fencing material
Improved land management on: **Clearfountain**	Replace and repair fencing Accommodation for rangers Training programme for rangers Communication equipment for rangers Active control of invasive alien plants Environmental education facility Funding of an independent ecologist for the setting up of a monitoring system and annual assessment	Raise conservation value of land by improving level of conservation management	Clear-fountain (see Map)	Letabeng Montane Grassland and Pindhela Moist Grassland, containing: Rudd's Lark, Yellowbreasted Pipit, *Aloe modesta, Aloe kniphofoides, Eucomis montana, Watsonia latifolia* Bushmen Rock Art, Anglo-Boer war sites, medicinal plants protecting water catchment, fire patterns and migration routes	201 habitat hectares of Letabeng Montane Grassland 64 habitat hectares of Pindhela Moist Grassland 8 habitat hectares of Northern Afro-temperate Forest	Annual budget to pay guards Annual budget to pay for labour to strip out invasive alien plants Funds to purchase fencing material

Desired outcomes	Activities	Rationale	Location	Components conserved	Predicted gains	Costs
Improved livestock husbandry on the NtabaManzi communal lands	Training on livestock management, better breeding stock and inputs such as additional nutrients and vaccinations and assistance with new marketing channels	Make good the shortfall of 31 animal units after controlled access to grazing on Sweetwater has partially addressed the loss of grazing caused by the mine	NtabaManzi communal lands			Funds to cover livestock improvement activities
Medicinal plants nursery	Establish a medicinal plants nursery at the Sweetwater offset site	Compensate the Traditional healers within the NtabaManzi Community for their loss of access on the mine site	Near the NtabaManzi Community	*Aloe modesta, Aloe kniphofoides, Eucomis montana, Watsonia latifolia,*		Funds for nursery establishment, site preparation and transfer of plants from project site

Appendix A: Using the Biodiversity Offset Cost-Benefit Handbook

This example shows how the steps in the Biodiversity Offset Cost-Benefit Handbook (see **www.forest-trends.org/biodiversityoffsetprogram/guidelines/cbh.pdf**) can be applied and integrated into the final offset design defined by using the Offset Design Handbook (see Figure A.1 below). This example has been kept simple, focusing on project site stakeholders only and a relatively small number of people. It is assumed that the offset activities do not affect other local STAKEHOLDERS. This means that the costs and benefits for local stakeholders can be examined using relatively simple methods such as biodiversity proxies supplemented by some economic analysis. In other situations where the project site stakeholders are more numerous and heterogeneous, and where the offset activities affect other local communities, it will be necessary to put more emphasis on sampling and more complex economic valuation methods.

Figure A.1: The relationship between the Biodiversity Offset Design and Cost-Benefit Handbooks



Activity 1: Identify the project's direct and indirect residual impacts on local use and enjoyment of biodiversity

The aim is to identify any biodiversity related impacts of the project on local stakeholders that might have been missed in the project design and appraisal process. Although the steps are presented sequentially, they may well be conducted concurrently or involve an iterative process. For example, as analysis of the impacts is conducted further information is obtained about the local stakeholders affected.

Cost-Benefit Handbook Step 1: Define the components of the project

The first step is to understand the scope of the project that will have an impact on biodiversity. This builds on the work done in Step 1 of the Biodiversity Offset Design Handbook (see **www.forest-trends.org/biodiversityoffsetprogram/guidelines/odh.pdf**). This step entails clearly listing the various components of the project and their (approximate) locations (Map 2), the duration of their impact and the degree of certainty regarding the likelihood of the impact actually occurring. This enables a preliminary identification of the local stakeholders whose use and enjoyment of biodiversity may be affected by the project in a direct and indirect way.

The impacts of the principal aspects of the project are translated into a map of the study area which also provides LANDSCAPE CONTEXT. The DIRECT and INDIRECT IMPACTS are plotted.

Cost-Benefit Handbook Step 1.2: Identify the affected local stakeholders

The local stakeholders whose use and enjoyment of biodiversity are likely to be affected by the project are identified.

The main groups potentially affected are the NtabaManzi community that lives and farms land next to the proposed mine site. Within this community there are a number of traditional healers who form part of an association of healers which uses medicinal plants from the area, including the proposed project site.

The land on which the mine is to be sited is privately owned and a deal for land purchase has been negotiated with the owner as part of project design and appraisal. There are also some private landowners in the vicinity of the site but it is the communal farmers that are closest and thus are likely to be most affected.

There are two other local stakeholder groups likely to be affected indirectly by the biodiversity related impacts of the project:

- Tourism enterprises whose business depends on the bird watching and wildlife viewing potential of the area
- A fly-fishing enterprise downstream from the mine site which may be affected by increase of sediment resulting from removal of vegetation cover.

Table A.1: Affected local stakeholders

Stakeholders*	Summary description	Project activities affecting stakeholder group	Affected sub-groups within stakeholder group
DIRECT AREA OF INFLUENCE			
NtabaManzi Community	54 families on communal land adjacent to the development site dependent on farming (maize and livestock) and remittances	Habitat clearing	Three members of the ThabaMvelo Traditional Healers association collect medicinal plants at the development site
Letabeng private landowners	Mostly farmers with 100 – 1,000 ha of land each	Not affected directly as not adjacent to the development site	
INDIRECT AREA OF INFLUENCE			
Tourism enterprises based on bird watching	Five lodges and guesthouses offering bird watching tours as main attraction	Habitat clearing reduce the bird population in the area and its attractiveness for visitors	
Fly-fishing enterprise	Local farms adjacent to river downstream of the development site offer daily and weekly fly-fishing facilities for tourists and visitors	Increase in sediment associated with removal of vegetation affects water quality and fish populations	

* *All stakeholders listed here are fictional. They are however modelled on similar existing organisations with similar interests and institutional set-up in other parts of the country.*

Cost-Benefit Handbook Step 1.3: Define the without project baseline

The local people's use and enjoyment of biodiversity in the direct area of influence of the project is assessed taking into account any future trends in the absence of the project.

As the land where the mine is to be sited is privately owned, little attention was given in the ESIA to local uses of biodiversity by the neighbouring communal farmers. It is therefore necessary to supplement the available information.

Interviews with key informants such as representatives of the NtabaManzi Community Trust and a group discussion are used to gather information. This reveals that the farmers in this community have for many years used part of the mine site for grazing their livestock in addition to their own land. They have also collected non-timber forest products (NTFPs) from the mine site, (mainly thatching grass) and medicinal plants.

Grazing is likely to continue as the main LIVELIHOOD activity but will become less productive as the land becomes degraded. Remittances are currently an important source of income for community members and are likely to become more important as grazing productivity declines.

Cost-Benefit Handbook Step 1.4: Identify impacts

This builds on Step 1 in the Offset Design Handbook which identifies direct and indirect project impacts on biodiversity. The direct impacts on biodiversity involve the near-total loss of the current vegetation cover. Any

rehabilitation will still only result in secondary grassland that will for many decades be low in species diversity relative to the original grasslands.

Comparing this information with the findings of the BASELINE STUDY confirms that the neighbouring communal farmers will be affected as they will no longer be able to use the land for grazing or collect non-timber forest products (NTFPs) from this area even after rehabilitation. Another direct impact is that members of the local traditional healers' association will no longer be able to collect medicinal plants on the mine site.

The indirect impacts are dual. Firstly, there is a risk of increased sediment loads in the streams as well as a risk of pollution. This could affect the fly fishing enterprise downstream. Secondly, there are adverse implications for local tourism enterprises catering for birdwatchers. The removal of vegetation at the mine site coupled with the noise from mining operations and heavy vehicles transport will affect bird populations, reducing the attractiveness of the area for birdwatchers. As a result there is likely to be drop in the number of visitors, affecting the profits of these local tourism enterprises.

Cost-Benefit Handbook Step 1.5: Define compensation measures already included in project design and ESIA

Measures to mitigate the impacts identified above were not addressed in the project design and ESIA.

Cost-Benefit Handbook Step 1.6: Identify residual impacts

The MITIGATION HIERARCHY is applied to the impacts identified above. The direct impacts on local STAKEHOLDERS are not avoidable further as all options to reduce the land take have been explored in project design. The impacts on water quality in the indirect area of influence which affect the fly-fishing enterprise can however, be addressed through a number of erosion control measures.

This leaves the following RESIDUAL IMPACTS that need to be offset:

1. NtabaManzi Community:

- Informal grazing access to the project site.
- Informal access to NTFPs (thatching grass mainly) and medicinal plants at the project site.

2. Tourism enterprises based on bird watching:

- Reduction in number of visitors and hence profits.

Activity 2: Identify the impacts of proposed offset activities on local stakeholders

This explores how conservation activities at the offset sites will impact local stakeholders and how socioeconomic activities that benefit local stakeholders can result in CONSERVATION GAINS and thus make an important contribution to biodiversity offsets.

Cost-Benefit Handbook Step 2: Identify potential offset activities

A list of offset activities is compiled. This starts with the offset options identified in the Worked Example, which consist of improving land management in four sites, through fencing, reduced stocking rates, removal of alien species, employment of rangers to deter illegal resource harvesting and control marauding packs of domestic dogs; and active fire management. Three of these sites, Sweetwater, Sandriver and Twinstreams are privately owned and would need to be purchased. The fourth site, Clearwater, is owned by the Provincial Government.

To this list are added activities necessary to compensate local stakeholders for residual project impacts. Options include:

- Controlled access to grazing for the NtabaManzi community in the Sweetwater purchased offset land.
- Improved livestock husbandry on the NtabaManzi communal lands to increase animal productivity.
- Hiring additional grazing from one of the neighbouring commercial farmers.
- Controlled access to medicinal plants in the Sweetwater purchased farm.
- Medicinal plants nursery.

No additional activities are necessary for the tourism enterprises as the conservation activities proposed in the area for the offset will be sufficient to maintain the attractiveness of the area for bird-watching.

The following step identifies some further offset activities to address underlying causes of BIODIVERSITY LOSS by involving local stakeholders and some activities to compensate them for land and resource use restrictions entailed by the offset options.

Cost-Benefit Handbook Step 3: Identify impacts of offset activities on local stakeholders

Rapid assessment of the local stakeholders living close to the proposed offset sites shows that the offset activities will have minimal impacts. All four sites are surrounded by other private farms which will not be affected adversely by any changes in land management on the offset sites.

Activity 3: Estimate the costs and benefits to local stakeholders of project residual impacts and offset options

Cost-Benefit Handbook Step 4: Scope cost-benefit comparisons

The cost-benefit comparisons that need to be made for each stakeholder group are then compiled.

Table A.2: Stakeholder costs and benefits

Stakeholder group	Costs implied by the project	Potential costs from the offset activities	Potential benefits from the offset activities
Stakeholders affected by the project and offset			
NtabaManzi communal farmers	Loss of grazing Loss of NTFPs (food, thatching grass)	Costs associated with using other sites for grazing and NTFP collection – travel time Increase in labour associated with improved livestock husbandry	Grazing on offset sites or private farms Direct – provision of training and improved stock / equipment Indirect – increased livestock output on own land
Traditional healers within the NtabaManzi community	Loss of access to medicinal plants	Increase in travel time to the collection site	Controlled access to medicinal plants on offset site Medicinal plant nursery
Tourism enterprises based on bird-watching	Loss of business as attractiveness of area for bird watching reduced	None identified	Offset sites will increase bird-watching appeal.
Offset site stakeholders (not affected by the project)			
None identified			

Issues to be considered include

1. ***Level at which to make the comparison.*** Is a community level comparison appropriate for all the impacts? Baseline analysis has shown that the farmers in the NtabaManzi community are broadly similar in terms of numbers of livestock and cropping area and also in their use of NTFPs. But only three members of the community are traditional healers and make use of medicinal plants. These therefore need to be treated separately.

2. ***Comparison of different patterns of costs and benefits over time*.** The costs from the project impacts (and the offset site) are immediate and are likely to decline over time because of overharvesting. The benefits from access to grazing on offset sites are immediate, but are at a lower level. However, they will be maintained over many years. The benefits of improved livestock husbandry will take a few years to be fully realised but the costs in terms of labour are immediate. Comparisons will therefore need application of a DISCOUNT RATE that reflects the situation facing farmers. Alternatively farmers in discussions on different packages need to be made aware of the different timing of costs and benefits.

3. ***Offsetting illegal or unsustainable use of resources.*** Most of the offset activities proposed are addressing use of resources that are both unsustainable and involve informal access to land and resources, formally owned by others. But there is long-standing recognition of informal access. As discussed above, the land on which the development project is sited could well have had little use for grazing in ten years time if current overgrazing had continued. Should grazing at the current rate be the basis for comparison even though it is not sustainable? In this case the pragmatic decision is taken to consider the current rate as the basis for comparison on the grounds that if the offset is to be successful, the threats to biodiversity need to be reduced.

Cost-Benefit Handbook Step 5: Estimate costs and benefits

The next step is to compile and analyse the information needed to make these sets of project costs, offset costs and offset benefits comparable.

All the costs and benefits identified involve DIRECT USE VALUES so biodiversity proxies and market-price methods can be employed.

Some additional information is needed to cross-check information obtained in the baseline assessment and to fill in gaps. For the NtabaManzi community which is relatively small, a group discussion and some interviews with families are conducted. This provides confirmation that nearly all of the farmers in the community are making use of the mine site for additional grazing and for harvesting of thatching materials. It also enables firming up of the estimates of animal stocking rates, area of the mine site used for grazing, annual quantities per household of thatching materials collected and time involved in travelling to the mine site.

Costs associated with project impacts

NtabaManzi Community:

- **Grazing:** The development will result in the direct loss of approximately 160 ha. However, this loss of grazing resources is compounded by the need for a safety and security area around the mine. The community will lose access to a total of 220 ha in terms of grazing land. Eighty hectares of the original farm however will still remain accessible. The mining company now owns this land and access to these 80 hectares of grazing resource is regulated by them.

  Currently, some 210 head of cattle and some 640 sheep are being grazed on the 760 ha available to the community (460 ha communal land and 300 ha in the project area). A conversion to Animal Units (using metabolic values relative to a standard steer of 450 kg) yields the stocking shown in Table A.3.

Table A.3: Livestock totals

Species	Current number	Number of Animals per Animal Unit	Animal Units	Stocking on 760 ha
Sheep	640	4.35	147	
Cattle	210	1.00	210	
Total			357	2.13 ha / AU

The loss of access to 220 ha in the project area translates to a loss of carrying capacity of 103 Animal Units. (This is based on the current stocking even though current grazing is too high to be sustainable – see the previous step).

- **NTFPs:** From the survey and rapid baseline assessment it is estimated that on average each household harvests about 10 bundles of thatching grass per year from the mine site and from their own land. It is not possible to determine the precise amounts harvested from the mine site but information from the interviews suggests that a pro rata assumption based on equal amounts per hectare would be appropriate. It is also confirmed that the communal farmers do not factor in the time taken to collect these materials as collection takes place in the course of their journeys to the site to check on their livestock.

Costs and benefits associated with the offsets

NtabaManzi community:

- Access to **grazing** can be provided on the Sweetwater offset site but at a lower stocking density than the community enjoyed on the project site. An appropriate stocking rate would allow 72 animal units to be supported. This leaves a shortfall of 31 animal units.

  This can be supplemented by hiring grazing on private farms. This would require 120-150 ha and as the farms with available grazing to hire are some distance away from the community would increase the time spent travelling or away from home. The community would also need assurance that the hiring cost would be covered for them on a permanent basis.

- The other main alternative is to help the communal farmers improve the productivity of their livestock so that there is more output for the same stocking density. This increases the labour input of each farmer by up to one day per week. Current minimum wage rates for farm workers in rural areas are about R 1,000 per month. However, as there are few employment opportunities locally, the OPPORTUNITY COST for the farmers of these extra days will be considerably lower, say 50%. The offset option is to provide training, better breeding stock and initially inputs such as additional nutrients and vaccinations. In subsequent years, it is envisaged that the farmers will cover these. This will enable farmers to obtain more meat from each animal and to produce higher quality animals that can fetch a higher price. But the farmers' ability to secure these higher prices will depend on their links to markets which recognise quality differences. If the farmers use the same market channels as before, it is likely that they will not receive higher prices. An essential part of the offset therefore is to establish a link with a new market channel and to help the communal farmers improve their marketing skills. For these reasons the market benefits may take a few years to fully materialise.

  A simple way of assessing whether this livestock improvement option is adequate compensation is to use biodiversity proxies. With the additional grazing provided on the Sweetwater offset the community will have grazing for 326 animal units (254 AU on the communal land and 72 AU on the Sweetwater offset). A 10% increase in the productivity of these animal units would be equivalent to 32.6 animal units, roughly equal to the shortfall in grazing that needs to be covered.

  This simple comparison does not take into account the labour costs that the farmers incur, and the time lag and uncertainty involved in the materialisation of market benefits. However, efficiency improvements are expected to be considerably higher than 10%, more likely to be between 20% and 30%, and there will be subsistence benefits in the form of increased meat for own consumption. Based on this conservative estimate, the communities' additional income from the livestock improvement will more than compensate for the extra labour costs.

  This information about the options is discussed in a community assembly with nearly all the farmers present. The simple comparison based on biodiversity proxies is considered sufficient to proceed as it gives an approximate but safe assurance of NO NET LOSS. As there are relatively few farmers affected, it is possible to proceed without more detailed quantification.

- **NTFPs – Thatching Grass:** Controlled access to NTFPs can be provided at the Sweetwater offset site. As this site is larger than the project site, there is agreement with the farmers that even at lower harvesting rates, this provides sufficient compensation. It is also agreed that as collection will be combined with grazing activities, there is no need to consider any increases in travel time.

Traditional healers within the NtabaManzi Community:

- Biodiversity proxies can also be used for this group as the medicinal plants they are concerned about can be replaced on a LIKE-FOR-LIKE basis. They do have to travel further to get to the proposed new site but as there are only three people involved, it is straightforward to discuss and agree ways of addressing this. All three agree that the increased range and availability that is provided by the medicinal plants nursery more than makes up for this increase in travel time.

Activity 4: Specify a fair and effective offset package

The final activity is to bring together all the cost and benefit estimates relating to a preliminary set of offset options, to examine the implications for local stakeholder groups. A final check is made that the proposed offset activities provide sufficient compensation for any residual project impacts and that there are no distributional issues, within or between local stakeholder groups. If necessary, adjustments in design are made and analysed.

In this case, as there is only one local stakeholder group involved, the NtabaManzi community, this final activity is straightforward and no adjustments are needed.

Table A.4: Current local stakeholder use and enjoyment of biodiversity in area of project activities

Affected stakeholders	Direct use (consumptive) values		Non-consumptive use values		Cultural use / NON-USE VALUES		Future Trends
	Terrestrial	Freshwater	Terrestrial	Freshwater	Terrestrial	Freshwater	
Direct area of influence							
NtabaManzi Community Trust	Non-timber forest products, (thatching grass and medicinal plants) Grazing						Dependence on grazing will continue but grazing land will become less productive given over-grazing
Letabeng private landowners	Grazing						
ThabaMvelo Traditional Healers Association	Collection of medicinal plants				Culturally important plants / totem species		Likely to remain important over next 20 years
Indirect area of influence							
Fly-fishing enterprises		Clean water					
Tourism enterprises focusing on bird watching			Recreation – wildlife viewing (birds)				Growing industry likely to expand

Table A.5: Impacts, compensation measures in project design, mitigation hierarchy and residual impacts

Local stakeholder	Project Activity	Impact	Sub-group particularly affected?	Adequate compensation measures in project design?	Which impacts still need addressing?	Avoid?	Reduce?	Residual impacts	Offsetable?
Direct area of influence									
Mountain Timber & Sawmilling Company				Yes					
NtabaManzi Community	Habitat clearing	Loss of access to NTFPs	Traditional healers in who harvest medicinal plants	No because access was informal	Loss of access to NTFPs				Yes
Letabeng private landowners				Yes – full land value					
Indirect area of influence									
Fly-fishing enterprise	Removal of vegetation cover	Increased sediment and water pollution affects fish populations		No as link not realised	Impact on fish populations		Erosion control measures reduce to minimal level	Not significant	
Tourism enterprises focusing on bird watching	Habitat clearing	Reduction in bird populations		No as link not realised	Reduction in bird populations				Yes

For the final offset design, taking these issues into consideration, please see the summary in Table 17 on page 51.

To learn more about the BBOP principles, guidelines and optional methodologies, go to:

www.forest-trends.org/biodiversityoffsetprogram/guidelines