

AN ENVIRONMENTAL MANAGEMENT FRAMEWORK FOR THE VERKYKERSKOP AREA

1. Introduction

This Environmental Management framework (EMF) is one of the key safeguards documents developed in support of the Spatial Development framework (SDF) of Verkykerskop.

An EMF presents a general overview of environmental issues and potential impacts associated with the activities of the township establishment such as the one planned at Verkykerskop. The framework document is especially important in defining the approach to be taken to the assessment of environmental and social issues and their management, as well as the process of consultation with stakeholders and disclosure of related information. Whereas the aim of the project specific EMPs is to ensure that projects are implemented in an environmentally acceptable manner, the EMF is aimed at ensuring that the choice and design of projects are inherently acceptable from an environmental perspective.

EMF aims to establish a sound basis for mitigation, monitoring, and management at the project level. EMF as strategic document should highlight major impacts of concern in the sector and should prescribe standard approaches to sub-project design and mitigation through environmental guidelines, manuals and monitoring requirements. This reduces the scope of work for individual EAs and EMPs for subprojects, and can positively influence investment activities throughout the sector or region.

In other words an Environmental Management Framework (EMF) is a framework of spatially represented information connected to parameters, such as ecology, hydrology, infrastructure and services. The main purpose of an EMF is therefore to pro-actively identify areas of potential conflict between development proposals and critical/sensitive environments (DEAT, 1998).

The following parameters need to be addressed:

1. Agriculture;
2. Ecology;
3. Topography;
4. Hydrology;
5. Geology;
6. Land Use;
7. General

2. Constraints:

The most significant constraints for development at Verkykerskop area include:

- Occurrence and distribution of red data fauna and flora species;
- Sensitive surface hydrological features, including wetlands, pans, rivers and streams;
- Significant natural open space connectors
- Occurrence of large areas of medium and high potential agricultural land;
- Areas with potential geotechnical constraints;
- Potential noise constraints due to noise emanating from major roads;
- Potential pollution sources from local waste facilities,

Constraint zones:

- Agricultural constraint zone
- Geotechnical constraint zone
- Ecological / hydrological constraint zone
- Agricultural and geotechnical constraint zone
- Agricultural and ecological / hydrological constraint zone
- Geotechnical and ecological / hydrological constraint zone
- Geotechnical, ecological / hydrological and agricultural constraint zone
- No to Low constraint zone.

3. Environmental Characteristics of the Verkykerskop area

This section outlines the findings of the environmental investigations conducted as part of this local environmental study and provides details of existing site characteristics. It provides the methodology for each of the investigations conducted as part of this assessment and identifies the capability of the land for development purposes according to the particular constraint examined. Development constraints and general management issues which need to be considered in the formulation of development guidelines for the study area are also outlined.

3.1 General Physical Attributes

The topography of the study area is generally undulating, except for a steep sloped valley (creek) in the south-eastern corner of the property. A low rise that dips sharply towards the west occur on the north-western side of the property.

The natural vegetation across the study area has been identified as forming a number of communities each dominated by a small number of shrub, grass or sedge species in association with a variety of other plant species. In addition, along the slopes of the ravine as well as in the headwaters marshy seepage areas occur.

The area is well-drained but these marshy areas can become flooded after periods of rain. These characteristics result in generally waterlogged conditions which would have made the area unsuitable for development. The valley forms a number of smaller, creeks which dissect the study area. The northern creek is narrow as is dominated by *Leucosidea sericea* shrub, while the western creek is more open and dominated by grassland. A few stands of exotic trees such as *Populus x canescens*, *Acacia mearnsii* and *Eucalyptus camuldulensis* and *E. sideroxylon* occur. Deep erosion dongas are present in the creeks.

3.2 Topography, Geology and Soils

3.2.1 Methodology

The methodology for determining the topography, geology and soil conditions comprised a desktop study, followed by a field inspection, preliminary subsurface investigation. The scope of the assessment included:

- desktop literature search of geological maps, soil landscape maps, topographic maps, and available relevant investigation reports on neighbouring sites as well as the subject site;
- walk-over survey and mapping of the study area. Observations were made of surface slopes, vegetation, erosion conditions and drainage paths;

- A hydrological study was conducted by a geo-hydrologist. Boreholes were drilled in the valley to determine the yield and quality of the ground water.

The results of the above reviews, investigation and testing were assessed to determine areas suitable for development and any potential development constraints (geotechnical).

3.2.2 Topography

Topographically the site is typically of an undulating relief, with surface levels generally varying between 1 754m and 1 936m above sea level. The hill on the south-western boundary of the property rises to approximately 18 metres above sea level with surface slopes with maximum gradients of approximately eight degrees.

3.2.3 Geology

The general geology of the area is of the Karoo Sequence. In the area the high hills area covered by sandstones of the Clarens Formation. This layer is underlain by the red and blue mudstones of the Elliot Formation. Below this formation is the Molteno Formation which consists of alternating layers of mudstones and sandstones. Further down layers of the Beaufort Formation can be found. Dolerite dykes and sills cut through these sedimentary layers to form outcrops that are resistant to weathering.

3.2.4 Soils

Soil Characteristics

Information on soils was derived from the Landtype data (Land type Survey Staff 1922). The arable areas of the site is documented as being underlain by the Clovelly form. Towards the drainage soil forms such as Kroonstad and Arcadia can be found.

Limitations are documented as including wind erosion hazards on disturbed crop fields, seasonal water logging, and water erosion of the dispersive soils.

The residual soils over mudstones and minor interbeds of lithic sandstones are present along the edges and slopes of the creeks. In areas the soil depth is up to two metres deep on parent rock. Limitations include high erosion hazard, moderate foundation hazard, and seasonal waterlogging.

Erosion Potential

Due to the relatively steep gradients across the slopes of the creeks, erosion caused by high velocity run off is not likely to be a major constraint to development. Evidence of scouring or erosion was observed in the valley.

Steeper slopes on the valley sides could be subject to significant erosion if run off is not adequately managed.

Contaminated Soils

Potential sources of soil contamination at the site could be associated with past and present land use activities, and migration of contaminants from adjacent sites from past and present land use. Based on the observations made on site during the walk-over survey, contamination from site activities could include solid waste dumping, concentration of urine and manure at the cattle enclosures, etc.

No obvious signs of dumping of imported fill were observed across the site during the site inspection. On the above basis it is anticipated that soil contamination is likely to be limited in extent.

3.2.5 Geotechnical Constraints and Management Issues

Terrain Unit Characteristics

The site has been divided into Terrain Units based on topographic and subsurface conditions.

The geotechnical constraints to development have been considered taking into account slope stability, erosion potential, dispersive soils and foundation conditions.

Development Capability

The majority of the site is considered suitable for development from a geotechnical viewpoint.

3.3 Surface Water and Groundwater

3.3.1 General

The water related characteristics of the study area are a mainly function of the topography and geology of the site. The site has an undulating topography, with steep slopes in the valley. Studies undertaken to determine the existing water related characteristics are presented in the hydrological report.

The key characteristics for each of these issues are summarised below.

3.3.2 Surface Hydrology and Drainage

The site has a relatively simple drainage regime traversing a undulating topography. It includes man-made impoundments. Subsurface groundwater flow is a dominant process across the site during periods of dry weather. The interaction of surface water after heavy rain with natural high water tables, adds to the complexity of the hydrology of the site. The drainage of the entire study area is towards the valley. A low ridge running north-south bisects the north-western part of the site.

3.3.3 Flooding

Flood levels around the site are restricted to the drainage lines.

3.3.4 Groundwater

The subsurface stratum across the flat part of the site comprises mostly medium grained sand. Towards the valley and in the valley the subsurface stratum comprises mostly of fine-particles clays. Groundwater chemical analysis was undertaken to determine background concentrations of selected analytes and to determine if the groundwater system is impacted by past land uses. These background concentrations are useful in assessing the suitability of stormwater discharge to the groundwater system. The groundwater sampled low in dissolved solids and slightly acidic. The acidic groundwater is natural, however, elevated TKN (nitrogen) and phosphorous concentrations suggest some low level contamination from past land uses.

3.3.5 Water Quality

The activities that have occurred on and around the site that may influence ambient water quality include land clearing, cattle grazing, land filling, burning off veld, fertiliser

application, liming, ploughing, limited residential development with septic tanks, and road construction.

Pollutants entering waterways may be in the form of siltation, heavy metals, constituents causing a change in pH, or excessive nutrients such as nitrogen and phosphorus. Pollutants entering the study area's waterbodies are typically from diffuse sources primarily associated with agricultural activities.

In future water quality control ponds must be constructed to treat runoff from residential areas before being discharged into the natural watercourses. Runoff from both developed and undeveloped areas is further treated by the wetlands situated in the valley. No treatment facilities exist for developed runoff at present.

There is no existing water quality data on the in-stream water quality for drainage lines within or adjacent (Meul River) to the study area. In regard to the expected ambient conditions on a regional scale, the water quality has been identified as being good under low to average flow conditions, with some episodes of elevated nutrients and bacteria present in some poorly flushed systems. There is also a tendency towards high turbidity levels during periods of high flow.

3.4 Ecological Characteristics

3.4.1 Flora

Methodology

The vegetation of the study area has been mapped by means of air photo interpretation. Preliminary stratification of the vegetation into photo types was undertaken by reference to diagnostic features such as colour, texture, crown architecture, aspect and topographic position.

A survey was subsequently undertaken over a period of two days in April 2007 to verify community boundaries. During this process observations were made of the structure and floristic composition.

An additional 5 by 5 metre plot was also placed in each vegetation community in the study area. A species checklist was also compiled during this fieldwork.

Vegetation Communities

Ten vegetation communities were identified in the study area as described below. Descriptions of their structural and floristic characteristics are also outlined.

Rare or Threatened Species:

A search was undertaken of the red data list of South African plant species occurring within five kilometres of the study area. This literature search showed that no rare or threatened plants have previously been recorded within five kilometres of the site. However during the field survey two rare plant species were found in the study area. They are *Brachystelma perditum* and *Khadia sp.nov* cf (*K. beswickii*).

Vegetation Communities:

Community 1: *Leucosidea sericea* – *Buddleja salviifolia* Shrubland.

Structure

This community consists of a low to medium shrub layer reaching a height of between 1,5 and 2.5 metres in height. The density of the community varies from sparse to dense.

Floristic Description

The dominant shrub species in this community are: *Leucosidea sericea*, *Buddleja salviifolia*, *Polygala virgata*, *Rhamnus prinoides*, and *Kiggelaria africana*.

Distribution

This community is found along the slopes and floor of the northern and eastern creeks.

Community 2: *Tristachya leucothrix*- *Themeda triandra* Grassland

Structure

This community consists of an open to closed grassland reaching a height of between 0,3 and 0,6 metres in height. The density of the community varies from sparse to dense.

Floristic Description

The dominant grass species in this community are: *Tristachya leucothrix*, *Themeda triandra*, *Eragrostis curvula*, *Digitaria eriantha*, *Alloteropsis semialata*, and *Hyparrhenia hirta*.

Distribution

This community is found on deep sandy soils along the slopes of the valley as well as on the undulating plains.

Community 3: *Eragrostis plana* – *Aristida junciiformis* Grassland

Structure

This community consists of an open grassland reaching a height of between 0,3 and 0,6 metres in height. The density of the community varies from sparse to dense.

Floristic Description

The dominant grass species in this community are: *Eragrostis plana*, *Aristida junciiformis*, and *Hyparrhenia hirta*.

Distribution

This community is found on disturbed sites where trampling and overgrazing occurred.

Community 4: *Heteropogon contortus* – *Themeda triandra* Grassland

Structure

This community consists of an open grassland reaching a height of between 0,3 and 0,6 metres in height. The density of the community varies from sparse to dense.

Floristic Description

The dominant grass species in this community are: *Eragrostis curvula*, *Aristida junciiformis*, *Heteropogon contortus* and *Themeda triandra*.

Distribution

This community is found on arid dolerite outcrops.

Community 5: *Delosperma roseapurpureum* – *Oropetium capense* Grassland

Structure

This community consists of a sparsely vegetated grassland reaching a height of between 0,03 and 0,05 metres in height. The density of the community varies sparse due to the shallowness of the soil.

Floristic Description

The dominant grass species in this community are: *Eragrostis racemosa*, *Oropetium capense*, and *Delosperma roseopurpureum*. The two Red data species namely *Brachystelma perditum* and *Khadia sp.nov cf (K. beswikkii)* also occur in this habitat.

Distribution

This community is found on very shallow soils on sandstone outcrops on the edge of the valley.

Community 6: *Eleocharis limosa* Pan Community

Structure

This community consists of a sparsely vegetated sedge community reaching a height of between 0,3 and 0,5 metres in height.

Floristic Description

The dominant aquatic plants in this community are: *Eleocharis limosa*, and *Aponogeton juncea*.

Distribution

This community is found in the pan on the property.

Community 7: *Cyperus longus* – *Scirpoides dioicus* wetland community

Structure

This community consists of a sparsely to densely vegetated sedge community reaching a height of between 0,3 and 0,5 metres in height.

Floristic Description

The dominant aquatic plants in this community are: *Eleocharis limosa*, *Cyperus longus* and *Scirpoides dioicus*.

Distribution

This community is found in seepage areas on the property.

Community 8: Stands of exotic plants

Structure

These communities consist of densely vegetated mono-stands of the various exotics. The height varies between 3m (*Acacia mearnsii*) and 5m (*Eucalyptus camuldulensis*).

Floristic Description

The various stands consist of exotic species such as *Acacia mearnsii*, *populus x canescens*, *Eucalyptus camuldulensis*, *E. sideroxylon* and Kikuyu lawn (*Pennisetum clandestinum*).

Distribution

This community is found around the old farmsteads and in the valley.

Community 9: Cleared land

Structure

These communities consist of a mixture of pioneer species of exotic as well as indigenous origin. The height varies between 0,3m and 0,5m.

Floristic Description

The various stands consist of exotic species such as **Argemone ocoleucra*, **Tagetes minuta*, *Hyparrhenia hirta*, *Eragrostis curvula*, and **Amaranthus caudatus*.

Distribution

This community is found on old cropfields.

3.4.2 Fauna

Previous Surveys in the area

Previous surveys by the National Museum have been undertaken in parts of the eastern Free State. Several mammals were observed during these surveys. Numerous reptiles (snakes, lizards, tortoises) is known to occur in this region. Five frogs were also recorded. A number of additional threatened fauna species (especially birds such as Wattled Crane, Blue Crane, Southern Crowned Crane, Rudd's Lark, Botha's Lark, etc) were considered likely to occur in the region.

Survey Methodology

Fifteen fauna survey sites were selected in the study area, based upon vegetation types, access and distribution over the site. The survey was designed to assess the fauna occurring on the site and in adjacent areas, with particular emphasis on the detection of threatened species considered likely to occur. Records were compiled of mammals, birds, reptiles and amphibians located in the field during the survey, either through trapping or incidental observation.

Survey methods involved:

Spotlighting;

Ground Sherman Trapping;

Playback Calls;

Habitat Searches;

Bird Surveys;

Reptile and Amphibian Searches;

3.4.3 Conservation Values

Vegetation Conservation Values

The conservation values of the vegetation communities area based upon distributional abundance, the adequacy or otherwise of its conservation in other reserves and National Parks and the presence of threatened or noteworthy species. In keeping with the mapping of other land suitability issues in this study, a conservation rating of high, medium and low has been assigned to each vegetation type, as displayed in *Table 3.1* below:

Table 3.1: Conservation Values of the Study Area

Community	Importance Conservation	Value
1	This community would provide important nesting and sheltering habitat for a variety of birds. No threatened species were recorded in this community.	High
2	This community is an important mesic grassland and would provide important nesting and sheltering habitat for a variety of birds. Threatened species were recorded in this community.	High
3	This community is not important and can be regarded as a disturbed mesic grassland. No threatened species were recorded in this community.	Medium
4	This community is not an important dry grassland and would provide important nesting and sheltering habitat for a variety of birds. No threatened species were recorded in this community.	Medium
5	This community is an important open grassland. Threatened plant species were recorded in this community.	High
6	This community is an important aquatic community and would provide important nesting and sheltering habitat for a variety of birds especially cranes and water fowl. Threatened species were recorded in this community.	High
7	This community is an important seepage community. It protects the soil from erosion.	High
8	This community is not an important community as it is dominated by exotic plants. However it provide important nesting and sheltering habitat for a variety of birds and mammals. No threatened species were recorded in this community.	Low
9	Very simple structure. May provide a foraging resource for birds and mammals. No threatened species recorded in the area.	Low

Wildlife Corridors

The study area supports wildlife corridors around the clusters of houses. These vegetated areas link the various plant communities and the fauna would migrate with ease between the different communities. It would also provide an important corridor for other mammals, birds and provide for the flow of genetic material.

Habitat Disturbance

Areas of the site close to the buildings have been significantly disturbed in the past and are continuing to be degraded. Much of the central area of the site has been underscrubbed, ploughed, fertilised and seeded with exotic grasses. The cleared areas have been the most disturbed, with the removal of the native grasses.

Biological Ranking of the Site

The habitat ranking system is undertaken to assess the relative values of the habitat within the study area, based upon an assessment of eight factors for each mapped vegetation unit. Each factor was assigned a numerical value generally between zero and three, except in the case of disturbance which is assigned a negative rating. Each of these factors is explained in *Table 3.2* below. The first three relate to the individual vegetation unit, while the remaining five relate to its value within a vegetation complex.

Table 3.2: Habitat Ranking Factors

Habitat Factor	Description
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Habitat Value	This factor is based upon the assessment of the habitat values of each vegetation community outlined in <i>Table 3.1</i> . Each value is assigned a numerical value of between 3 and 1, with 3 relating to high quality habitat and 1 low quality habitat.
Conservation Value	This factor relates to the vegetation communities conservation value in the region, as outlined in <i>Table 3.1</i> . Values are assigned in a similar manner to the habitat values with a value of 3 representing a high conservation value and 1 representing a low conservation value.
Disturbance	The majority of vegetation communities in the study area have had some disturbance to them to varying degrees, either through fire, grazing, ploughing, tracks/fences or weed invasion. Disturbance is also often a transitory state, with the vegetation community commonly recovering once the disturbance is halted. Areas with high levels of disturbance are assigned a negative rating of -3, areas with moderate disturbance -2 and areas with low disturbance -1. All areas with minimal or no disturbance are given a value of 0.
Habitat Node	This factor relates to whether the individual vegetation unit is part of a larger Habitat node, which will influence the value of the area for fauna. The larger the vegetated area usually the higher the diversity of fauna it can support. In this way if the unit is part of a vegetated area which is less than 0.5 km ² it was given a habitat node value of 0. If the area forms a vegetated patch between 0.5-1 km ² it was assigned a value of 1; between 1-3 km ² it was assigned a value of 2; while if the area is greater than 3 km ² it was given a rating of 3.
Corridor Potential	The corridor potential of a vegetation unit was also assessed. Vegetated corridors were identified and units forming a more or less continuous corridor were assigned a value of 3. Units not forming a continuous corridor, but occurring near a corridor band were given a value of 2, while isolated units or units outside the identified corridors were given 1 point.
Proximity to other vegetation units	This factor relates to the isolation of vegetation units and therefore their value to fauna. If a vegetation unit is less than 50 metres from another unit, then it is assigned a rating of 3. If it is between 50 and 250 metres it was given a value of 2. If it is between 250 and 500 metres from another unit then it was only given a value of 1, while if it is greater than 500 metres it was given a rating of 0.
Local Area Biodiversity	This factor relates to the variability of vegetation units within 1 km ² . This is based upon the higher the diversity of vegetation types in an area, the higher the faunal habitat values. One square kilometre was chosen as it would encompass the home ranges of the majority of sedentary fauna species which require a range of vegetation types within close proximity. A value of 3 for local biodiversity is applied to areas that have greater than 5 different vegetation communities within one square kilometre. A value of 2 was given to units that have between 3 and 5 different types within one square kilometre, while a value of 1 was applied to areas with less than 3 different communities.
Known presence of threatened species	This factor varies in value with the records of threatened species. A vegetation unit that has one or more records of a threatened species within a 1 km radius was given a value of 1 for each threatened species. All other units were given 0.

Table 3.3: Ranking Methodology Summary

Value Factor	1	2	3
Habitat Value	Low	Medium	High
Conservation Value	Low	Medium	High
Disturbance	Low (-1)	Medium (-2)	High (-3)
Habitat Node	0.5-1km ²	1-3 km ²	>3 km ²
Corridor Potential	Outside Corridor	Near Corridor	Continuous Corridor
Proximity	(note >500m=0)	250-500m	50-250 m <50 m

Local Area Diversity	<3 units	3-5 units	>5 units
Recorded Threatened Species	A Point for each Species within 1km.		

Therefore, the highest rating an area could be given would be 19 points (plus an extra point for each additional threatened species recorded) and the lowest would be three.

Methodology Limitations

While the methodology outlined above attempts to provide a comprehensive assessment of all factors, the variability of the natural environment and its relative value for fauna is difficult to quantify. The ecosystem is designed to function as a whole with many faunal groups requiring a range of habitat types within a given area to meet their foraging and sheltering requirements. Other fauna species have highly specialised requirements and are dependant upon a particular shrub/tree or microclimatic condition of a habitat for their survival. Therefore, any one vegetation area will provide high quality habitat for some species and poor quality habitat for others. This includes both highly disturbed or cleared areas and pristine communities.

In addition, assessment of any areas relative habitat value is subjective and based upon limited human perceptions of the environment. While the above methodology attempted to minimise individual human subjectivity, the assignment of numerical values and their relative weighting is initially subjective, despite being based on known ecological principals. Therefore, while the system is based upon a numerical ranking, the habitat map produced does not show individual numbers, but has divided the area into high, medium and low quality habitat as outlined below.

Habitat Conservation Mapping

The habitat conservation values for the study area are shown in *Figure 3.1*. This mapping while based upon the numerical ranking system outlined above, does not show individual numbers for each unit. This was undertaken to minimise the subjectivity of the viewer's individual interpretation of the relative weighting of each of the figures. A typical human response would be to assume that an area with a value of 18 is twice as good habitat as an area with a ranking of nine, three times as good as a three, etc. However, this purely mathematical approach does not adequately represent the complexity of the natural environment.

Therefore, the individual numbers, ranging from three to 19, were assigned to one of three classes: low, medium or high values. Units having a value of less than 8.5 were assigned a low habitat value. Medium values were given to areas with a rating of between nine and 14.5, while high quality habitat was assigned to any area with a rating of 15 or greater.

Ecological Constraints Map

3.4.4 Management Issues

The map of development constraints relating to ecological significance provides broad guidelines for development. Development of areas that are highly constrained would have a significant impact upon local populations of threatened species and is likely to result in local extinctions. Any proposed development in these areas would require the preparation of a Species Impact Statement (SIS).

Development of moderately constrained land may also result in a significant impact to threatened populations, however, the impact to populations would not be as great as the previous category. Areas of moderately constrained land may in fact be more constrained if additional surveys were undertaken in these areas and threatened species detected. These areas may also require an SIS to be prepared, especially to examine the impact of the development on surrounding populations of threatened species.

While a diverse range of threatened fauna species were recorded in the study area, previous clearing and other disturbances that has been undertaken on the site has degraded the area. While the habitat in the area currently supports viable populations of threatened species, any more loss of habitat is likely to result in local extinctions in the area.

Development of even the land with few constraints may also significantly affect the populations of the site with increased impacts, such as additional disturbance to adjoining habitat, presence of domestic pets and mortality through collisions with vehicles. Any development of the site should be carefully planned with adequate buffer areas between developments and threatened species habitats.

3.5 Grassland Fire Hazard

Once a grassland fire has ignited, the intensity and rate of spread is controlled by the volume and availability of stored energy in the burnable material particularly, the litter layer and the rate at which combustion releases energy.

While fires (both frequency and intensity) can have devastating effects on the local ecology, perhaps the most significant are its effects on populated areas. There are a number of factors that are the most significant causes of house destruction. They are:

- high intensity fires due to high fuel loadings within 50 to 100 metres of the development;
- the presence of combustible objects near the house;
- the presence of trees over five metres tall within 40 metres of the house;
- a lack of fire resistant roof material and extremes in roof pitch;
- the use of combustible or easily breakable wall material; and
- the absence of human resource to fight small fires.

To reduce the probability of fires affecting urban areas, action should be taken to reduce or remove existing combustible fuel and separate structures from areas containing large volumes of fuel. If houses are to be constructed in fire prone areas, construction materials should be used that are fire-resistant and unprotected inner parts of buildings should be constructed so that they are protected from access by mobile residue.

3.5.2 Hazard Assessment

Hazard assessment involves determining the approximate intensity of a fire should one be ignited in the study area. It attempts to quantify the volume of existing fuel while taking into account the effects of slope change. Based on the methodology, six questions need to be answered when assessing the hazard potential of a site. They include:

Are fires known to occur in the area and if so, to what size and extent?

The study area has a history of a number of reasonably sized fires usually resulting from arson attacks. Fires have been found to usually break out in the grassland to the west of the study area.

Do the grasses that form the fuel bed, regularly dry out and burn readily?

Much of the grass layer has been cleared in the areas within much of the central part of the site (perhaps 60 percent) and now consists mainly of a sparsely grassed area. The rest of the site is covered by dense easily combustible grasses. These areas can be regarded as a high-risk area.

Is the vegetation pattern such that extensive (rather than localised)?

The majority of the study area has not been developed. While there are cleared areas, in the central part of the study area contains large expanses of densely grassed areas.

Are any gaps in native vegetation filled with pine plantations or crops? Will these crops burn in the fire season? If so, with more or less intensity and with greater or lesser resistance to control than the native vegetation they have replaced?

There are areas to the south and north where crop fields exist. These fields are not covered by crops in the fire season.

Has recent development had little effect on the existing fire pattern?

Arson and carelessness has been identified as a major source of fire ignition. This may be correlated with recent development, however, this has not been statistically assessed.

Where the general fuel loadings are low or locally discontinuous, are aspect and slope likely to worsen the behaviour of any resultant fire?

Fuel loadings at the time of the assessment were fairly low, however, the weather had been very wet over a long period of time and the loads are likely to have been lower than during drier periods.

The topography of the site is largely flat with a valley facing to the south. Winds driving fires primarily derive from the north-west.

Conclusion on fire hazards

This analysis of the study area has identified areas of the site as being subject to fire hazard and has a medium to high risk of breakout. Furthermore, owing to the current lack of existing fire access, the site is also currently difficult to manage.

Fire hazard management

The roads or trails must:

- contain provision for two-way all-weather 2-wheel drive access;
- roads must include a minimum road reserve of 20 metres;
- fire trails, must have a minimum road reserve width of six metres;
- fire trails and roads must be linked into the street network;
- must avoid dead ends; and
- be designed in accordance with the specifications in the Guidelines.

3.6 Heritage

MDA commissioned consultant archaeologist Cobus Dreyer to undertake an assessment of the Native and European archaeological values of the land. The study had the following objectives:

- determine whether any sites, relics or locations of indigenous or European historic significance occurred in the study area;
- assess their potential scientific and cultural significance; and
- formulate appropriate strategies for their future management in relation to their likely significance, statutory requirements and the nature of the proposed development of the area.

3.6.1 Non-Indigenous Heritage European History

The first Europeans to enter the area were????

3.6.2 Indigenous Heritage Context and Background

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3.6.3 Archaeological Site Significance

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3.6.4 Heritage Constraints and Management Issues

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3.7 Visual and Scenic Quality

3.7.1 Methodology

An assessment of the visual assessment and landscape characteristics of the study area was undertaken together with an analysis of any likely subsequent change in these characteristics as a result of future development. Consideration was given to cumulative visual and landscape impacts arising from other developments surrounding the study area. The assessment undertaken in this study is based on the methodology outlined below:

- landscape description and assessment, comprising topography, vegetation types, waterways;
- viewer characteristics, comprising viewpoint analysis, distance and sensitivity zones; and
- impacting activities, comprising a description of impacting activities, adjacent activities and the cumulative impact.

This methodology is used to identify landscape management zones and determine visual quality objectives. The existing character of the study area was then assessed for its level of sensitivity to land use and development.

Assessment Criteria - Visual Quality

The study area has been broken into five broad landscape units taking into account slope, vegetation type and landscape cover. The landscape units are:

- undulating plain (vegetated and cleared);
- hills;
- water bodies;
- urban elements; and

- areas of land use disturbance.

The basic premise of visual quality assessment is that all landscapes have some value, but those with the highest diversity have the greatest potential for high scenic quality. Scenic quality is an assessment of the combination of elements used to identify the importance of the proposed development to potential viewers. The assessment of scenic quality ranks the landscape units in scenic quality classes, for example, high, medium and low. These classes are based on the diversity of form, line, colour and texture, prominence of landform, prominence of vegetation and geology, and waterbodies.

Vistas into the study area are difficult owing to the flatness of the land. The study area only becomes readily apparent close to the local shop. The views are filtered by alien vegetation (bluegums, wattles etc) in Verkykerskop.

Other external views are possible from the Harrismith – Memel Road.

3.7.3 Visibility and Visual Sensitivity

Visibility

To enable an assessment of the visual and landscape impacts, it was necessary to identify locations and elevations where the site is visible and which are believed to be representative of the general location and area.

Visibility is a combination of:

- topography in terms of elevation and aspect;
- the vegetative cover in terms of its extent and height; and
- distance from point of origin.

The visibility has been established by topographic analysis in combination with field survey to identify all the areas from which any proposed development would be visible. Owing to the extremely flat nature of the visual catchment and the extent of tall buffering vegetation, there is only a couple external viewing points into the site which is the high ground of the southern hill and well as to the north of the town.

Visual Sensitivity

To determine the visual sensitivity of a site, the ability of areas to absorb impacts within its catchment so that there are no adverse impacts on viewers, must be determined. Areas that have an open shrub or forest cover are considered to have the ability to absorb development better than those areas where such a shrub or forest cover is closed or not present at all (like in Verkykerskop). Factors such as the extent of clearing would affect this assessment. The nature of the exposure, its sensitivity, is affected by the use of the viewing site, the numbers of viewers and the activity that viewers are engaged in.

The study area has been broken up into areas of “high”, “medium” and “low” visual sensitivity. Areas of “high” sensitivity have little ability to absorb change without a significant effect. Mitigation measures should be used to significantly reduce the impact of any change. Areas of “medium” sensitivity have moderate capacity to absorb changes to the visual catchment. Therefore, greater levels of modification are possible before the new elements become intrusive. Areas of “low” sensitivity have the ability to absorb

modifications to the visual catchments readily, due to the lower number of viewers and/or locations and the overlaying topography.

3.7.4 Visual Constraints

Due to the flat topography of the study area, areas with lower visual sensitivity are located in the interior of the study area, while higher visually sensitive areas are located generally on the perimeter. Furthermore, the visible vegetation around the perimeter is less disturbed than the internal areas.

3.8 Land Use and Urban Infrastructure

3.8.1 Land Use

Land use in the study area is characterised by:

- existing vegetation, including remnant, plantation and cleared areas;
- cattle grazing; and
- dirt and tarmac access roads.
- buildings (shop, residential, prison, stores, etc.)

The study area has been subject to extensive disturbance from a variety of pastoral activities.

3.8.4 Water

The existing residential development on the site is presently serviced by boreholes. There is no other water supply infrastructure on the site.

A strategy is currently under way for the construction of a storage dam in the valley as well as a treatment plant and construction of a new storage reservoir.

A full water strategy for the Verkykerskop development will be required when a preferred development scenario has been finalised. An assessment will need to be performed to determine the most appropriate reticulation strategy.

3.8.5 Sewerage

Sewage from the present building in Verkykerskop is treated by individual septic tanks. At present, there is no existing sewer reticulation servicing. This will be installed once the infrastructure for the new development is taking place.

3.8.6 Electricity, and Telecommunications

Electricity supply

Electricity to Verkykerskop is via a 33 kilovolt subtransmission lines. An electrical services assessment will be conducted to determine the present capacity and future need as far as electricity is concerned.

Fuel

A 30 000l diesel tank at the local co-op is providing in the needs of the residents and farmers in the district. It is foreseen that a fuelling station will be constructed in Verkykerskop at a later stage.

Telecommunications

A cell phone mast on the dolerite hill to the south-west of the property provides coverage to the area.

3.8.7 Urban Infrastructure Constraints and Management Issues

The limited capacity of the existing water and sewer reticulation systems in Verkykerskop area means that augmentation of the systems would be required to meet the demand of any future development.

As mentioned a storage dam is planned in the valley to secure water capacity for the development.

An increase in sewage loads associated with development of the Verkykerskop will require the development of a sewage treatment system

There are no constraining issues for electricity and telecommunications.