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Proposed Alleen 2 Open Cast Extension at the Magdalena Colliery near Dundee, KwaZulu-Natal:

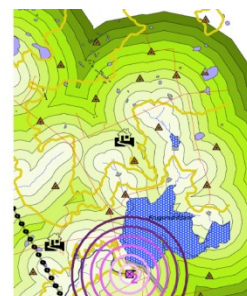
Desktop Ecological Assessment Report

Version - 2
15 April 2014

GCS Project Number: 13-727

Prepared For:
Zinoju Coal (Pty) Ltd

ZINOJU



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1 INTRODUCTION

1.1 Project Background

The Magdalena Colliery is an existing coal mine located approximately 22km north of the town of Dundee and approximately 325km east-northeast of the City of Durban, in the province of KwaZulu-Natal. The Colliery is located in the magisterial district of Amajuba and the local municipality of Dannhauser.

The mine operator and applicant, Zinoju Coal (Pty) Ltd (hereafter referred to as 'Zinoju') intend to extend their open cast workings into Farm Alleen 2 No. 4280 (**Figure 1**). The proposed mining extension requires environmental authorisation subject to an Environmental Impact Assessment (EIA) and as such GCS Water & Environment (Pty) Ltd has been appointed by the applicant as the Environmental Assessment Practitioner (EAP) responsible for conducting and facilitating the EIA. As part of the EIA process, GCS require a desktop ecological assessment to provide background information on the ecosystems and habitats onsite and their potential conservation value. A desktop survey is considered satisfactory at this stage due to the highly transformed nature of Farm Alleen 2 (hereafter referred to as the 'project site'). This report presents the findings of the desktop ecological assessment.

1.2 Project Description

The existing mining area is planned to be extended northwards by a total of 180 ha onto 18 portions of the Farm Alleen 2 No. 4280 (**Figure 1**). The opencast extension area will be 2350m long by 315m wide extending north from the existing open cast pit with an approximate area of 74ha. Planned mining will include 106ha of underground mining. The land is currently used by the local community for informal housing and grazing.

1.3 Scope of Work

The scope of work of the desktop assessment was to:

- Undertake a desktop delineation and mapping exercise of the potential vegetation communities and faunal habitats within the study area;
- Review all available literature, documentation and spatial datasets related to the study area in order to gain a preliminary understanding of the vegetation communities and faunal habitats present on the site;

- Identify and describe the potential impacts of the proposed mining on the ecological systems onsite; and
- Provide preliminary mitigation measures to avoid, minimise, repair and/or offset the severity/magnitude of the potential impacts on the delineated wetland areas.

1.4 Limitations of the Study

The desktop assessment involved a survey of existing literature and spatial datasets related to the site which were refined after an analysis of the colour aerial photography of the site. A rapid site walkover along the main road that traverses the site from west to east along the northern boundary of the proposed mining strip was conducted to confirm the desktop findings but no formal vegetation or faunal sampling was undertaken. Therefore, there are inherent limitations and uncertainties with the findings and conclusions made, particularly regarding site specifics.

Firstly, the spatial datasets utilised are predominantly coarse scale and provide local to regional indications of flora and fauna distributions. Furthermore, the flora and fauna databases for the site were generally limited.

Secondly, the use of colour aerial photography and 20m contours to refine the coarse scale datasets as well as gauge the state of the habitats has limitations, particularly the two dimensional nature of photographs and the subjective nature of aerial photographic interpretation.

2 KEY ECOLOGICAL TERMS AND CONCEPTS

For the purposes of this desktop ecological study, the units of identification and assessment were vegetation communities and faunal habitats and species. These concepts and key related concepts are briefly defined and discussed below.

2.1 Species

A species is a group of interbreeding organisms that do not ordinarily breed with members of other groups.

2.2 Populations

A population is a collective group of interbreeding organisms found in a particular locality at a certain time.

2.3 Communities

A community consists of populations of organisms inhabiting a common environment and potentially interacting with one another. It is a recognizable unit or group of organisms in space.

2.4 Ecosystems

An ecosystem is any definable ecological system or unit that consists of all organisms/biota (species, populations, communities) in a given area, the abiotic/physical environment (light, minerals, soil, water etc.) within that area, and the interactions and energy flows between these biotic and abiotic factors. An ecosystem's abiotic and biotic composition and structure is determined by the state of a number of interrelated environmental factors. Changes in any of these factors (e.g. nutrient availability, temperature, light intensity, grazing intensity, and species population density) will result in dynamic changes to the nature of these systems.

2.5 Habitats

A habitat is a definable environmental area that is inhabited by, and supplies the needs of, a particular species of animal, plant, or other type of organism. A habitat is made up of physical factors such as soil, moisture, range of temperature, and availability of light as well as biotic factors such as the availability of food and the presence of predators. The habitat must supply the needs of organisms, such as food, water, temperature, oxygen, and minerals. If the population's needs are not met, it will move to a better habitat.

2.6 Biodiversity

Biological diversity, or biodiversity, is simply the variety of life in all its forms. It is a broad unifying concept, encompassing all forms, levels and combinations of natural variation, at all levels of biological organization (Gaston, 2010). Biodiversity can be simply defined as "The variety of life in an area, including the number of different species, the genetic

wealth within each species, and the natural areas where they are found” Kotze *et al.* (2009).

3 ENVIRONMENTAL CONTEXT OF THE STUDY AREA

3.1 Climate

The project site is located within the Sub-escarpment Grassland Bioregion as defined by Mucina and Rutherford (2009), within the greater grassland biome of South Africa. This bioregion has been divided into a number of vegetation units based on climate, topography and geology. The project site is located within the Income Sandy Grassland (Gs 7) vegetation unit, which experiences summer rainfall with most rainfall occurring between October and March, much of which falls as thundershowers (Mucina & Rutherford, 2006). Mean annual precipitation is 750mm and mean annual potential evaporation is 1845mm (Mucina & Rutherford, 2006). The area is characterised by moderate frost.

3.2 Topography, Drainage and Watercourses

The local topography is characterised by relatively gently sloping and undulating surfaces bisected by drainage lines and punctuated with small table-like mountains and escarpments that are characterised by moderately to steeply sloping hillsides and mountain slopes. The existing Magdalena Colliery is located along the base and lower slopes of the eastern and north-eastern edge of Mount Johanna, a relatively small, oval-shaped mountain characterised by moderately steep slopes and a gently sloping and undulating plateau. The project site is located immediately west-north-west of the existing open cast workings and is similarly planned to extend across the lower slopes of Mount Johanna, along its northern edge.

The topography of the project site comprises a gently sloping to gently undulating plain-like surface that abuts a narrow spur that is characterised by moderately-steep slopes. The spur extends into the project site from the south and forms part of the northern edge of the escarpment that runs in a west-east direction.

The majority of the site comprises a gently sloping surface that is bisected by a number of south-north draining, non-perennial stream channels and gullies that are heavily incised and eroded. These channels are first order streams that coalesce downstream of the site to form the Poonaspruit, which is also a non-perennial stream.

From a drainage perspective, the project site is located within the headwaters of the Poonaspruit that is a left-bank tributary of the non-perennial Bloubankspruit. The Bloubankspruit is a left-bank tributary of the perennial Buffels River. From a catchment perspective, the site is located within the greater Thukela River catchment and more specifically the Buffels River sub-quadernary catchment No. 2575, within quadernary catchment V32D.

3.3 Geology and Soils

The local area is underlain by sediments of the Vryheid Formation. The Vryheid formation, part of the Ecca Group, is represented by alternating beds of shale, mudstone and a variety of fine grained to gritty feldspathic sandstones, carbonaceous shales and coal. Three coal seams; namely the Leader, Top seam and Bottom seam, occur within the region. The soil nutrient status of the sandy soils is poor and drainage in many areas is poor where sandy topsoils override subsoils with high clay content.

3.4 Vegetation Types

The project site is located within the Income Sandy Grassland vegetation unit as defined by Mucina & Rutherford (2006). The majority of the natural grassland has been cleared and/or transformed by rural development and overgrazing and associated erosion, and only small degraded/secondary patches remain in the steeper slopes.

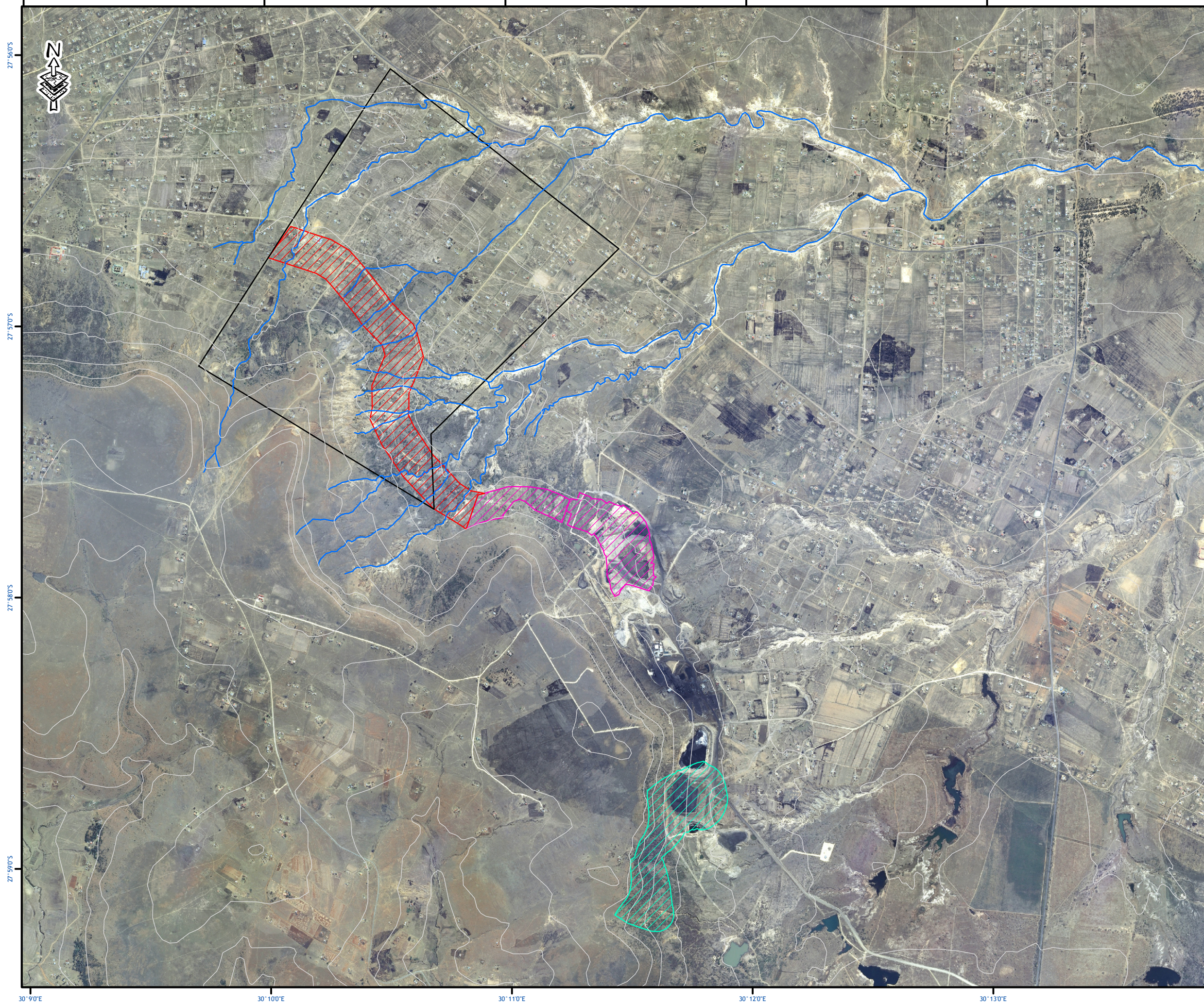
3.5 Land Cover and Land Use

Prior to mining of coal in this area, the middle and upper mid-slopes of the escarpment above the mine were used for grazing, while the more productive land in the gently sloping plain below escarpment was used for the cultivation of maize and other market related products. Due to the topography and the nature of the soils, intense farming has not taken place on large portions of the area. The physical and chemical nature of the soils and erratic climate render these areas agriculturally poor. Presently, the mine is surrounded by moderate to low density rural settlements consisting of traditional homesteads (imzi) and more formalised houses.

The proposed site for the opencast extension at Alleen 2 is previously disturbed, and consists of rural settlements (Anville). Large portions of the land have evidence of misuse in terms of large erosion gullies and overgrazing. Some subsistence farming (maize) and grazing occurs on site. Local access roads are present throughout the site.

Figure 1: Study Area & Environmental Features

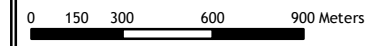
FIGURE 1: STUDY AREA & ENVIRONMENTAL FEATURES



- ### Legend
- Contours
 - Drainage Lines
 - Study Area
 - Proposed OC Workings Expansion
 - Current OC Workings
 - Proposed Discard Dump Expansion

Data Sources:

FIGURE NO.:	1
MAP NUMBER:	13-727/F1-01
DRAWN BY:	R. EDWARDS WETLAND SPECIALIST
REVIEWED BY:	P. LABUSCHAGNE DIRECTOR
DATUM:	WGS84
PROJECTION:	TRANSVERSE MERCATOR
LO:	29
DATE:	NOVEMBER 2013
CLIENT:	FORBES COAL
PROJECT:	MAGDALENA ALLEEN 2 OPEN CAST
SCALE:	1:25 013



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4 METHODOLOGY

4.1 Desktop Assessment

A comprehensive review of relevant available ecological information on the study area was interrogated to provide information on the anticipated extent, characteristics and importance of the vegetation communities and habitats onsite.

4.1.1 Freshwater Ecosystems

Information on the location, extent and conservation importance of the local streams, rivers and wetlands were extracted from the following data sources:

- 2010 colour aerial photography;
- National Geo-spatial Information (NGI) 1:50 000 topographical series;
- National Freshwater Ecosystems Priority Areas Project (NFEPA) (CSIR, 2011); and
- KwaZulu-Natal Freshwater Systematic Conservation Plan (Ezemvelo KZN Wildlife, 2007).

A rapid site walkover was conducted to confirm the above desktop findings.

4.1.2 Terrestrial Ecosystems

Information on the vegetation types and communities for the area were extracted from the following data sources:

- 2010 colour aerial photography;
- KwaZulu-Natal Pre-transformation Vegetation Map (Ezemvelo KZN Wildlife, 2011);
- South African National Vegetation Map (Mucina and Rutherford 2006);
- Landcover of KwaZulu-Natal (Ezemvelo KZN Wildlife, 2008); and
- KwaZulu-Natal Transformation (Ezemvelo KZN Wildlife, 2008).

Information on the conservation status and importance of the vegetation types and communities for the area were extracted from the following data sources:

- KwaZulu-Natal Terrestrial Systematic Conservation Plan (Ezemvelo KZN Wildlife, 2010);
- List of Threatened Terrestrial Ecosystems - Original Extent (SANBI, 2011);
- List of Threatened Terrestrial Ecosystems - Remaining Extent (SANBI, 2011);
- National Biodiversity Assessment (SANBI, 2012);

- National Protected Areas Expansion Strategy (NPAES) (2008);
- Critical Biodiversity Areas & Ecological Support Areas coverage, 2011; and
- Biodiversity & Mining Guidelines - Biodiversity Priority Areas (SANBI, 2012).

4.1.3 Flora and Fauna

Information on animal and plant species recorded for the Quarter Degree Square (QDS) 2730CC was extracted from the SABIF/SIBIS and POSA databases hosted by SANBI. These databases include the various botanical databases housed within SANBI as well as those from various herbaria and museums.

Other faunal data sources interrogated for the Quarter Degree Square (QDS) 2730CC included a number of conservation and citizen science databases run and facilitated by the Animal Demographic Unit of the University of Cape Town. These included:

- South African Bird Atlas Project 1 (SABAP 1);
- South African Bird Atlas Project 2 (SABAP 2);
- South African Reptile Conservation Assessment (SARCA);
- South African Frog Assessment Project (SAFAP);
- South African Butterfly Assessment Project (SABAP); and
- South African Mammal Map.

In addition, to these databases, the Important Bird Areas of Southern Africa (IBA's) (Bird Life South Africa, 1998) was also interrogated.

Information on threatened and red data plant and animals species for the area was extracted from the following data sources:

- KwaZulu-Natal Terrestrial Systematic Conservation Plan (Ezemvelo KZN Wildlife, 2010);
- South African Red Lists for Birds, Mammals, Reptiles & Amphibians, Butterflies and Plants; and
- International Union for the Conservation of Nature (IUCN) Red Lists.

4.1.4 Impact Assessment

The impacts of the proposed mining activity on the health/state of the freshwater and terrestrial habitats were assessed utilising an impact assessment method that provides an indication of potential significance. For this impact assessment, significance was

determined by aggregating the scores of four criteria, namely magnitude, duration, scale and probability. The impact assessment criteria, their descriptions and their scoring values are summarised in Table 1 below.

Table 1: Impact Assessment Criteria Description and Rating System

Score	Rating	Description
Impact Importance (Imp)		
5	High	The affected systems are near pristine and/or have numerous qualities which make them extremely valuable from an ecological and/or social (resource) perspective (i.e. the ecosystem services and goods provided are of high to very high importance).
4	Medium-High	The affected systems have qualities which make them highly valuable from an ecological and/or social (resource) perspective (i.e. the ecosystem services and goods provided are of moderately-high importance).
3	Medium	The affected systems have certain qualities which make them ecologically and/or socially valuable (i.e. the ecosystem services and goods provided are of moderate importance).
2	Medium-Low	The affected systems are of mild (moderately-low) importance in terms of ecological and/or social (resource) importance (i.e. the ecosystem services and goods provided are of mild/moderately low importance).
1	Low	The affected systems have very little value in terms of ecological and/or social (resource) importance (i.e. the ecosystem services and goods provided are of low importance).
Intensity (I)		
5	High	Impact affects the continued viability of the systems/components and the quality, use, integrity and functionality of the systems/components permanently ceases and are irreversibly impaired (system/population collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
4	Medium-High	Impact affects the continued viability of the systems/components and the quality, use, integrity and functionality of the systems/components are severely impaired and may temporarily cease. High costs of rehabilitation and remediation, but possible.
3	Medium	Impact alters the quality, use and integrity of the systems/components but the systems/ components still continue to function but in a moderately modified way (integrity impaired but functionality and major key processes/drivers maintained).
2	Medium-Low	Impact alters the quality, use and integrity of the systems/components but the systems/ components still continue to function in a slightly modified way and maintain original integrity (no/limited impact on integrity).
1	Low	Impact affects the quality, use and integrity of the systems/components in a way that is barely perceptible.
Duration (D)		
5	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
4	Long-term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (30 - 100 years).
3	Medium-term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (10 - 30 years).
2	Medium-short	The impact and its effects will continue or last for the period of a relatively long construction period and/or a limited recovery time after this construction period,

Score	Rating	Description
		thereafter it will be entirely negated (5 - 10 years).
1	Short-term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 - 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 - 5 years).
Scale / Extent (S)		
5	National & International	Effects of an impact experienced within a large geographic area beyond national boundaries and occurring at national scale (500km radius of the site).
4	Municipal & Provincial	Effects of an impact experienced within the region beyond municipal and provincial boundaries and occurring at a municipal and provincial scales (e.g. between a 100km to 500km radius of the site).
3	Town & Suburban	Effects of an impact experienced within the local town or suburban area (e.g. between a 5km to 50km radius of the site).
2	Local	Effects of an impact experienced within the local area (within 5km radius of the site).
1	Site & Surrounds	Effects of an impact are experienced within or in close proximity (100m) to the project site. However, the size of the site needs to be taken into account.
Probability / Likelihood (P)		
5	Definite	Impact will certainly occur (Greater than 90% chance of occurrence).
4	Probable	The impact will likely occur (Between a 70% to 90% chance of occurrence).
3	Possible	The impact may/could occur and has occurred elsewhere under the same conditions (Between a 40% to 70% chance of occurrence).
2	Unlikely	The chance of the impact occurring is moderately-low (Between a 20% and 40% chance of occurrence).
1	Improbable	The chance of the impact occurring is extremely low (Less than a 20% chance of occurrence).
SIGNIFICANCE = (I+D+S+P) x Imp		
>72	High	Totally unacceptable. Impact should be avoided and limited opportunity for offsets.
60 - 72	Medium-High	Generally to totally unacceptable. Ideally impact should be avoided unless offset by positive gains in other aspects of the environment that are of very to critically high importance i.e. national or international importance.
45 - 59	Medium	Undesirable to generally unacceptable. Ideally impact should be avoided unless offset by positive gains in other aspects of the environment that are of moderately-high to high importance.
32 - 44	Medium-Low	Acceptable.
4 - 31	Low	Acceptable.

5 DESKTOP ECOLOGICAL ASSESSMENT

5.1 Freshwater Ecosystems (Riverine & Wetland Systems)

5.1.1 Review of NGI 1:50000 Series and Aerial Photography

In terms of watercourses, the site is bisected by a number of incised, unnamed first-order ephemeral channels and erosion gullies (**Figures 2 & 3**). The onsite channels and their associated aquatic and riparian habitats appear to have been completely transformed by

intense bed and bank erosion and associated headward gulley erosion (**Figures 2 & 3**). Aerial photography indicates that the aquatic, riparian and wetland habitats that would have existed along the stream channels and drainage lines have largely been eroded out. Channel and gully erosion across the site is likely result of a combination of prolonged overgrazing, over use of common cattle paths, poor management and control of stormwater from informal roads, and the high erodibility of the soils, particularly those on the mountain slopes.

The heavily incised and eroded streams and gullies that drain the site join downstream to form the Poonaspruit. Like the onsite channels, the Poonaspruit channel has been substantially eroded and widened as a result of increased rates of erosion and no natural aquatic and riparian habitats remain. Similarly, the Bloubankspruit has also been transformed by increased rates of erosion.

No wetland areas appear to be present on or immediately downstream and/or adjacent to the project site.

Following a raid site walkover, all of the watercourses observed were incised and had eroded down to bedrock. Plates of the impacted watercourses are shown below.



5.1.2 National Freshwater Ecosystem Priority Areas Project (NFEPA)

Currently, there is no data on the Present Ecological State of the Poonaspruit and Bloubankspruit. However, based on aerial photography, it is clear that these streams are severely modified. The Present Ecological State of the Buffels River at its confluence with the Bloubankspruit is classified as 'Largely Natural' (Class B) (CSIR, 2011). However, it is expected that the Bloubankspruit is discharging elevated sediment and pollutant loads into the Buffels River at this point, contributing to some modification.

According to the National Freshwater Ecosystem Priority Areas (NFEPA) (CSIR, 2011), the sub-catchment within which the project site falls is a Fish Support Area (FSA) (**Figure 4**). In this case, the sub-catchment is classified as a FSA because it is considered important for the migration of threatened or near-threatened fish species, but is not a fish sanctuary. Fish sanctuaries are rivers that are essential for protecting threatened and near-threatened freshwater fish that are indigenous to South Africa.

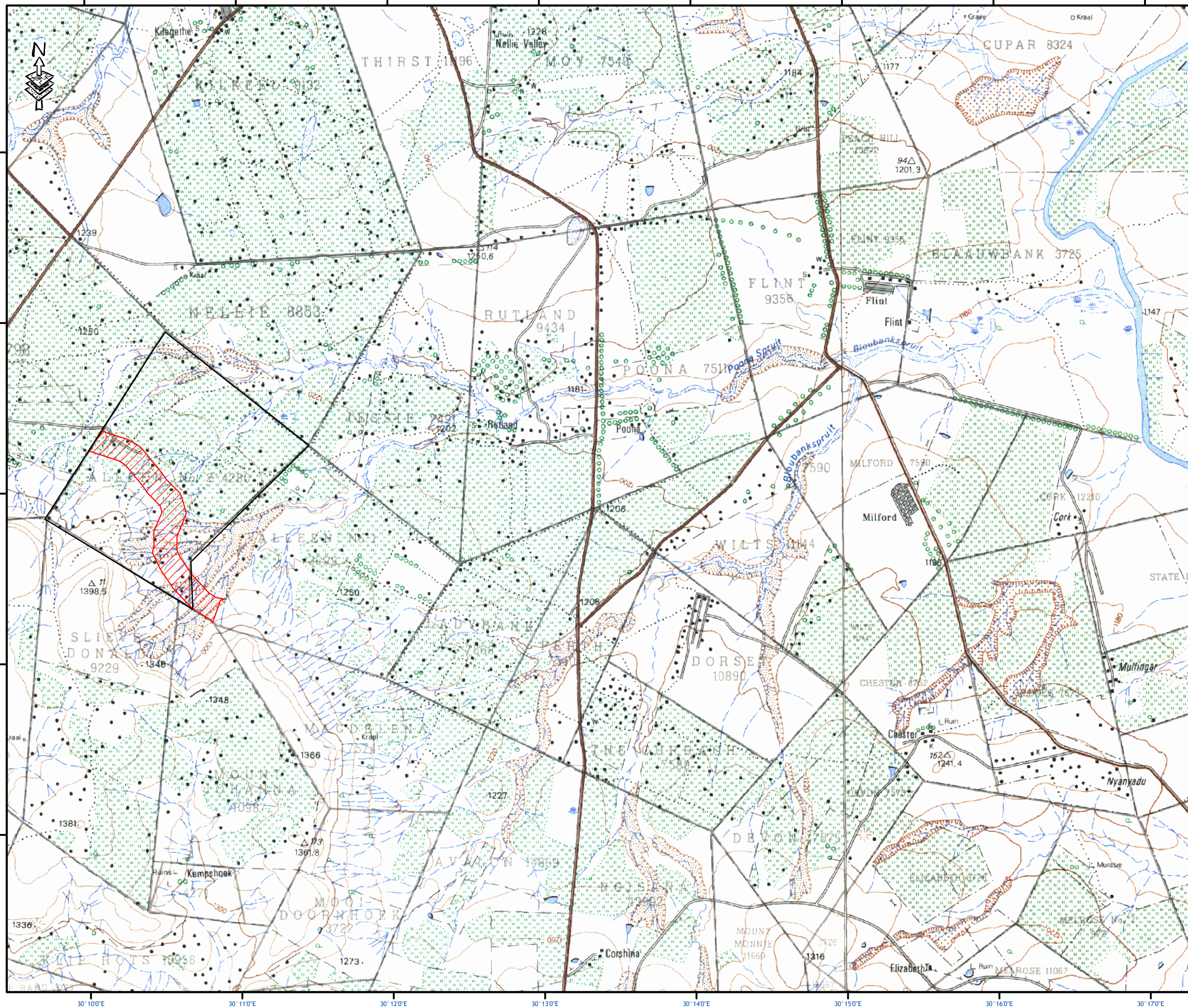
In terms of wetlands, the National Wetland Map 4 from the NFEPA indicates that there are no wetlands within or in the vicinity of the project site. In terms of downstream wetland habitats that might be affected by hydrological changes onsite, the closest wetland is the floodplain wetland located along the Buffels River, at the confluence of the Bloubankspruit with the Buffels River. Two wetlands are located closer to the site, but are not actually located along the Poonaspruit and Bloubankspruit and as such will not be impacted.

5.1.3 KZN Freshwater Conservation Plan



Ezemvelo KZN Wildlife's Freshwater Systematic Conservation Plan (SCP) (EKZNW, 2007) classifies the project to fall within planning unit 1456 as being 'Available' (i.e. untransformed biodiversity areas but not optimally required to meet biodiversity targets). The implications of this for the project is that the 'available' portions are available for development.

Figure 2: Watercourses Shown on the 1:50000 Maps

FIGURE 2: WATERCOURSES SHOWN ON THE 1:50000 MAPS



Legend

-  Study Area
-  Proposed OC Workings Expansion

Data Sources:

FIGURE NO.:	2
MAP NUMBER:	13-727/F2-01
DRAWN BY:	R. EDWARDS WETLAND SPECIALIST
REVIEWED BY:	P. LABUSCHAGNE DIRECTOR
DATUM:	WGS84
PROJECTION:	TRANSVERSE MERCATOR
LO:	29
DATE:	NOVEMBER 2013
CLIENT:	FORBES COAL
PROJECT:	MAGDALENA ALLEEN 2 OPEN CAST
SCALE:	1:40 000

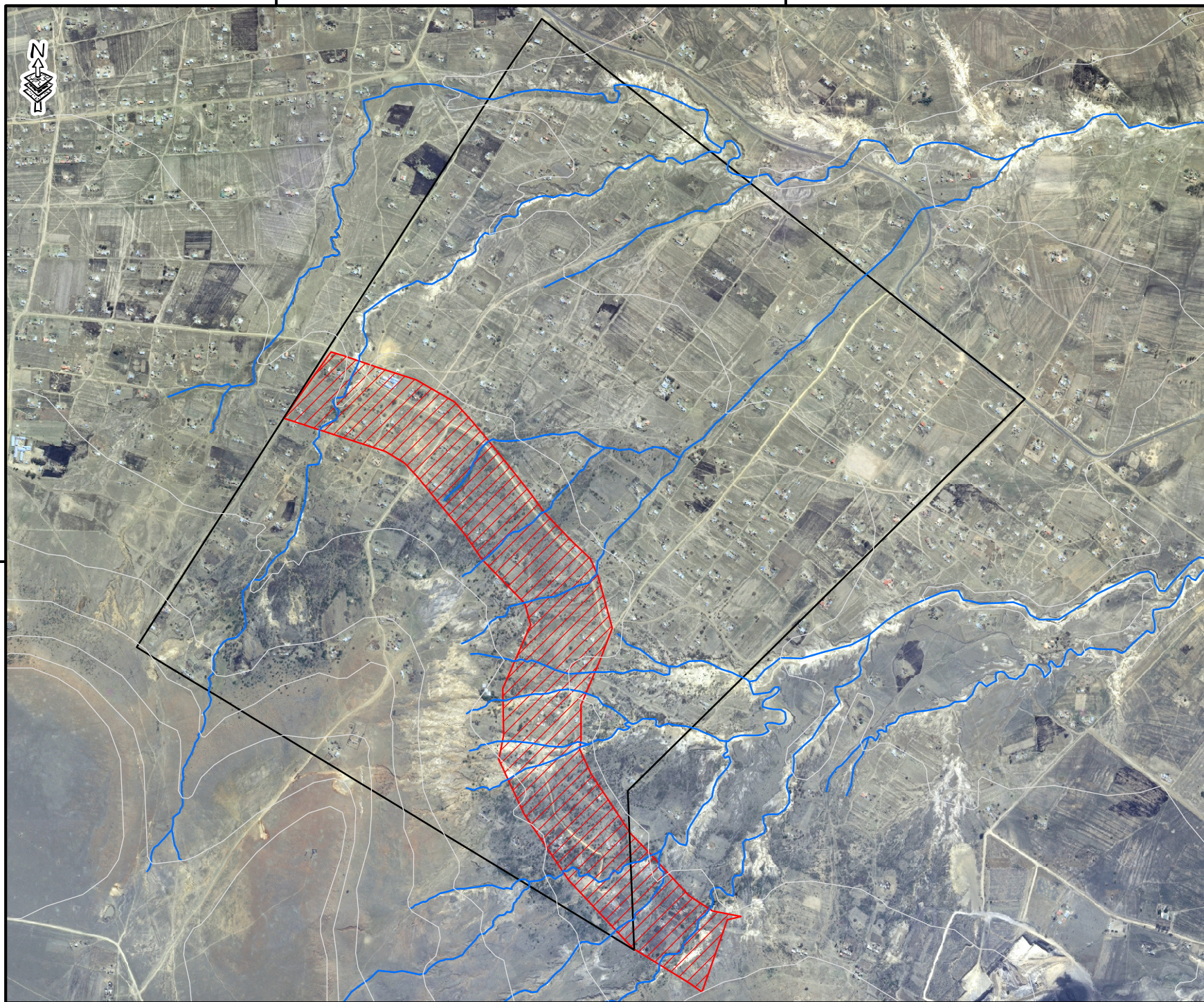
0 150 300 600 900 Meters







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Figure 3: Drainage Lines Delineated from Aerial Photography

FIGURE 3: DRAINAGE LINES DELINEATED FROM AERIAL PHOTOGRAPHY

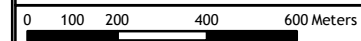


Legend

-  Contours
-  Drainage Lines
-  Study Area
-  Proposed OC Workings Expansion

Data Sources:

FIGURE NO.:	3
MAP NUMBER:	13-727/F3-01
DRAWN BY:	R. EDWARDS WETLAND SPECIALIST
REVIEWED BY:	P. LABUSCHAGNE DIRECTOR
DATUM:	WGS84
PROJECTION:	TRANSVERSE MERCATOR
LO:	29
DATE:	NOVEMBER 2013
CLIENT:	FORBES COAL
PROJECT:	MAGDALENA ALLEEN 2 OPEN CAST
SCALE:	1:16 859

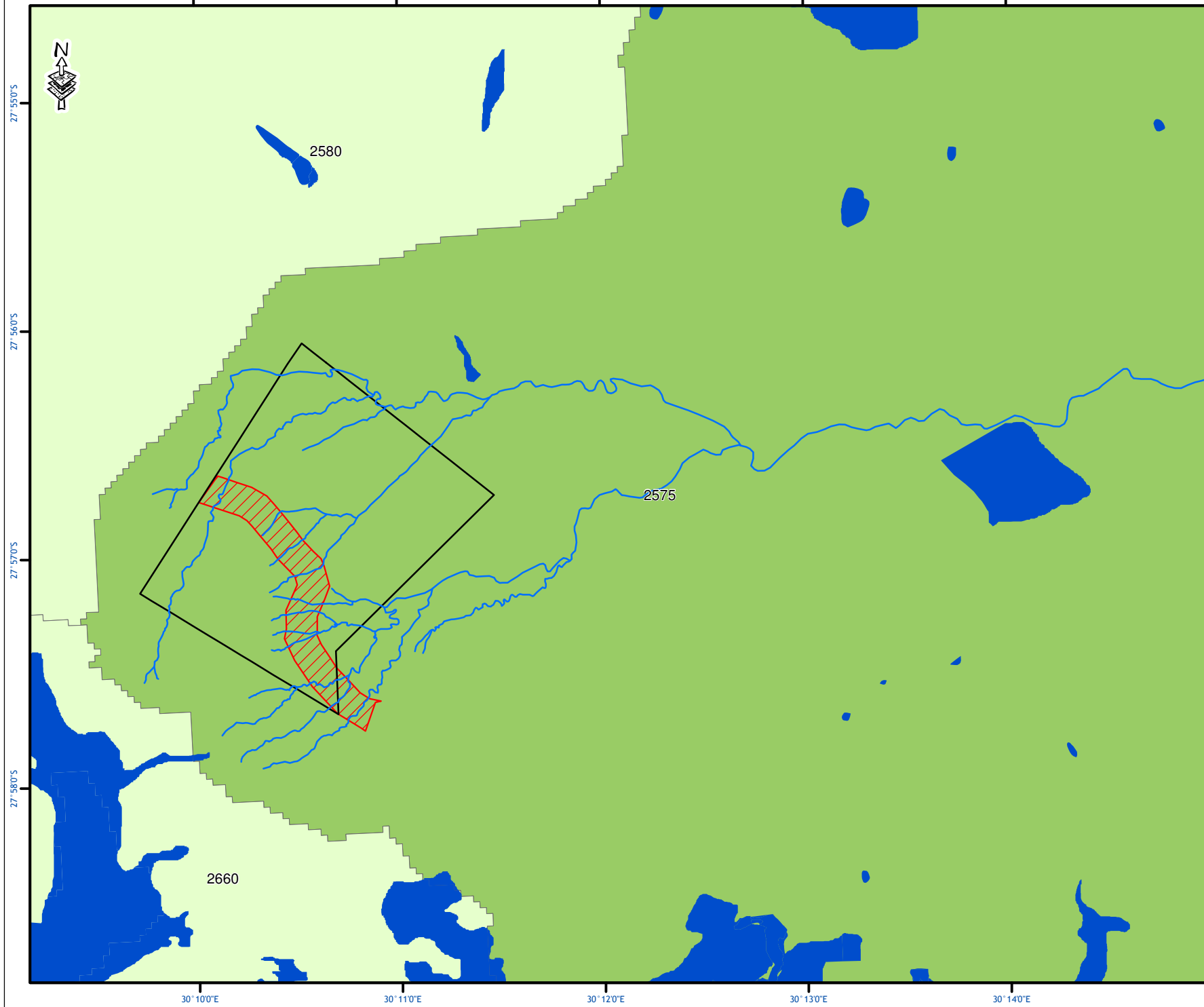



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Figure 4: NFEPA Rivers, Wetlands and Sub-Quaternary Catchment Status

FIGURE 4: NFEPA RIVERS, WETLANDS AND SUB-QUATERNARY CATCHMENT STATUS



Legend

- Drainage Lines
- Study Area
- Proposed OC Workings Expansion

NFEPA Wetland Map

Class

- Wetland (NFEPA Wetland Map)
- Wetland or Estuary FEPA

River Fepas

Class

- River FEPA
- Phase2FEPA
- Fish Support Area
- Upstream Management Area

Data Sources:

FIGURE NO.:	4
MAP NUMBER:	13-727/F4-01
DRAWN BY:	R. EDWARDS WETLAND SPECIALIST
REVIEWED BY:	P. LABUSCHAGNE DIRECTOR
DATUM:	WGS84
PROJECTION:	TRANSVERSE MERCATOR
LO:	29
DATE:	NOVEMBER 2013
CLIENT:	FORBES COAL
PROJECT:	MAGDALENA ALLEEN 2 OPEN CAST
SCALE:	1:41 427

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5.2 Vegetation Types and Communities

5.2.1 Broad Scale Vegetation Types

According to both the KZN Pre-transformation Vegetation Map (Ezemvelo KZN Wildlife, 2011) and the SA National Vegetation Map (Mucina and Rutherford 2006), the project site falls within the Income Sandy Grassland vegetation type (KZN Veg Type 10 or National Veg Type Gs 7) that is located within the Sub-Escarpment Grassland Bioregion and the greater Grassland Biome (Figure 5).

The Income Sandy Grassland occurs in a large triangle between Newcastle, Vryheid and Dundee and larger polygon in the Wasbank area in northern KwaZulu-Natal at an altitude range of 880-1 340 m (mainly 1 120-1 240 m) (Mucina and Rutherford, 2006). The vegetation type is associated with very flat extensive areas generally characterised by shallow, poorly drained, sandy soils that support low, tussock-dominated sourveld forming a mosaic with *Acacia sieberiana* var. *woodii* wooded grasslands and (Mucina and Rutherford, 2006).

Its historical coverage is 463,487.24ha with 44.59% natural habitat remaining. The conservation status of the vegetation type is classified as 'Vulnerable' (Mucina and Rutherford, 2006). This is due to the fact that the conservation target of 23.56% has not been attained as none of the vegetation type is conserved in statutory conservation areas. Some 55.41% has been transformed for cultivation, plantations and by urban sprawl. A small portion of the area has been lost to the building of dams (Klipfontein, Mvunyane). No serious infestations of invasive alien plants have been observed, probably due to the low nutrient status of soils.

5.2.2 Desktop Vegetation Communities

In terms of landcover, the KZN landcover dataset indicates that the majority of the project site comprises low density rural settlement and rural subsistence, particularly in the low gradient areas below (north of) Mount Johanna (Figure 6). The landcover in the southern parts of the site associated with the mountain slope are less developed and predominately comprise degraded grassland and extensive networks of erosion gullies (dongas), with isolated patches of intact grassland occurring to a lesser extent (Figure 6).

A review of colour aerial photography generally confirms the landcover data with the majority of the site being transformed by low density rural development and associated subsistence activities (**Figure 7**). The north-facing slopes are less developed but have been severely impacted by gully erosion and as such patches of degraded secondary grassland and secondary bush encroached grassland remain in un-eroded areas. The isolated patches of intact grassland picked up by the landcover dataset do not appear to be present. The only somewhat intact secondary vegetation communities that may show some resemblance to Income Sandy Grassland are the patches of grassland along the slopes of the spur in the southern parts of the site referred to as 'intact secondary grassland' (**Figure 7**). However, without a field assessment it is impossible to be sure.

The following broad vegetation communities can be identified based on a review of available aerial photography and satellite imagery:

- Intact secondary grassland;
- Eroded secondary grassland;
- Eroded woody encroached secondary grassland;
- Secondary dense closed woody vegetation;
- Bare and sparsely vegetated erosion gullies, dongas and channels; and
- Rural settlement and farming areas.

Intact secondary grassland:

An intact patch of secondary grassland is present in the southern parts of the site on the north-facing slopes of the spur as shown in **Figure 7**. The grassland appears to have been disturbed by some erosion and ongoing rural related disturbance like too-regular burning and overgrazing. However, unlike most of the site, erosion within the patch appears to have been moderately-low to moderate. It is likely that that the natural Income Sandy Grassland species assemblages have been altered and transformed but certain species typical of Income Sandy Grassland may be present. It is expected that the natural herbaceous diversity of the grassland is substantially reduced and limited.

Eroded secondary grassland:

The rest of the grassland patches have been transformed due to overgrazing and erosion and exist as small isolated patches interspersed between the erosion gullies and woody encroached areas. It is expected that these grasslands are dominated by typical increaser

species (e.g. *Cynodon dactylon*, *Sporobolous africana*, *Eragrostis curvula* and *Melinis repens*) and weedy herbaceous species, and that basal cover is substantially reduced.

Eroded woody encroached secondary grassland:

This community appears to be similar to the eroded grassland community described above except that the grassland has been invaded by woody shrubs and tree species, likely as a result of the exclusion of fire and/or edaphic (soil related) factors (e.g. shallow, rocky soils). The woody component of this community is expected to be dominated *Acacia karoo* trees and the grass component by typical increaser species for the area, namely *Cynodon dactylon*, *Sporobolus africanus*, *Eragrostis curvula* and *Melinis repens*.

Dense closed woody vegetation:

Throughout the above woody encroached secondary grassland community, there are small patches of dense woody vegetation that appear more closed in nature (**Figure 7**). It is expected that these denser patches have a handful of additional tree species in addition to *Acacia karoo* and that the grassy layer is sparser but resembles the generalist and increaser dominated species assemblages of the woody encroached grassland community described above.

Bare and sparsely vegetated erosion gullies, dongas and channels:

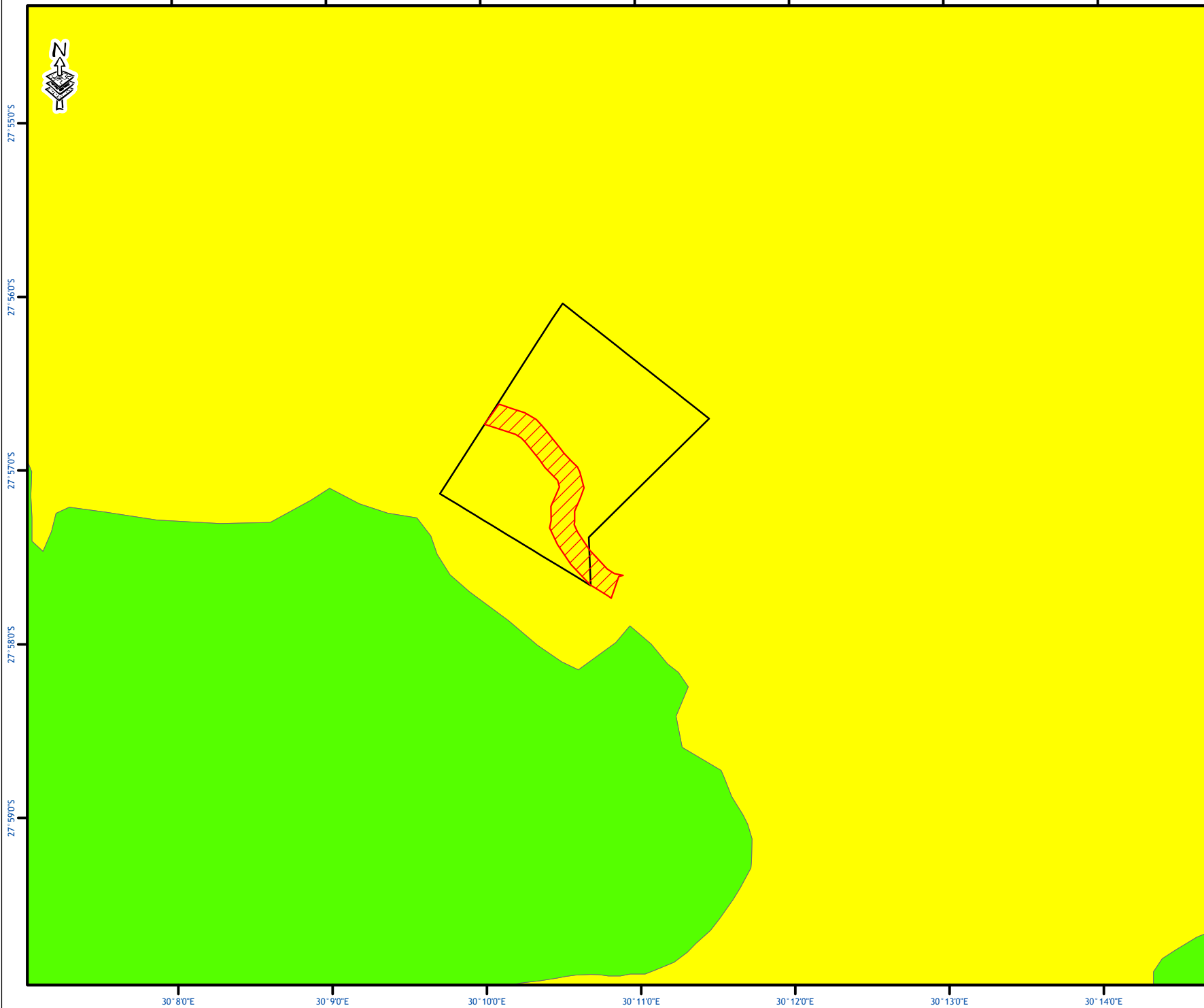
These areas are characterised by patchy, highly disturbed, secondary grasslands and woody patches dominated by typical increaser and weedy species.

Rural settlement and farming areas:

These areas have been cleared in the past for rural development and farming and are characterised by patchy, highly disturbed, secondary grasslands and woody patches dominated by typical increaser and weedy species.

Figure 5: National Vegetation Types

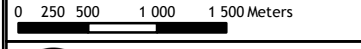
FIGURE 5: NATIONAL VEGETATION TYPES



- Legend**
-  Proposed OC Workings Expansion
 -  Study Area
- National Vegetation Types**
-  Income Sandy Grassland
 -  Northern KwaZulu-Natal Moist Grassland

Data Sources:

FIGURE NO.:	5
MAP NUMBER:	13-727/F5-01
DRAWN BY:	R. EDWARDS WETLAND SPECIALIST
REVIEWED BY:	P. LABUSCHAGNE DIRECTOR
DATUM:	WGS84
PROJECTION:	TRANSVERSE MERCATOR
LO:	29
DATE:	NOVEMBER 2013
CLIENT:	FORBES COAL
PROJECT:	MAGDALENA ALLEEN 2 OPEN CAST
SCALE:	1:54 615

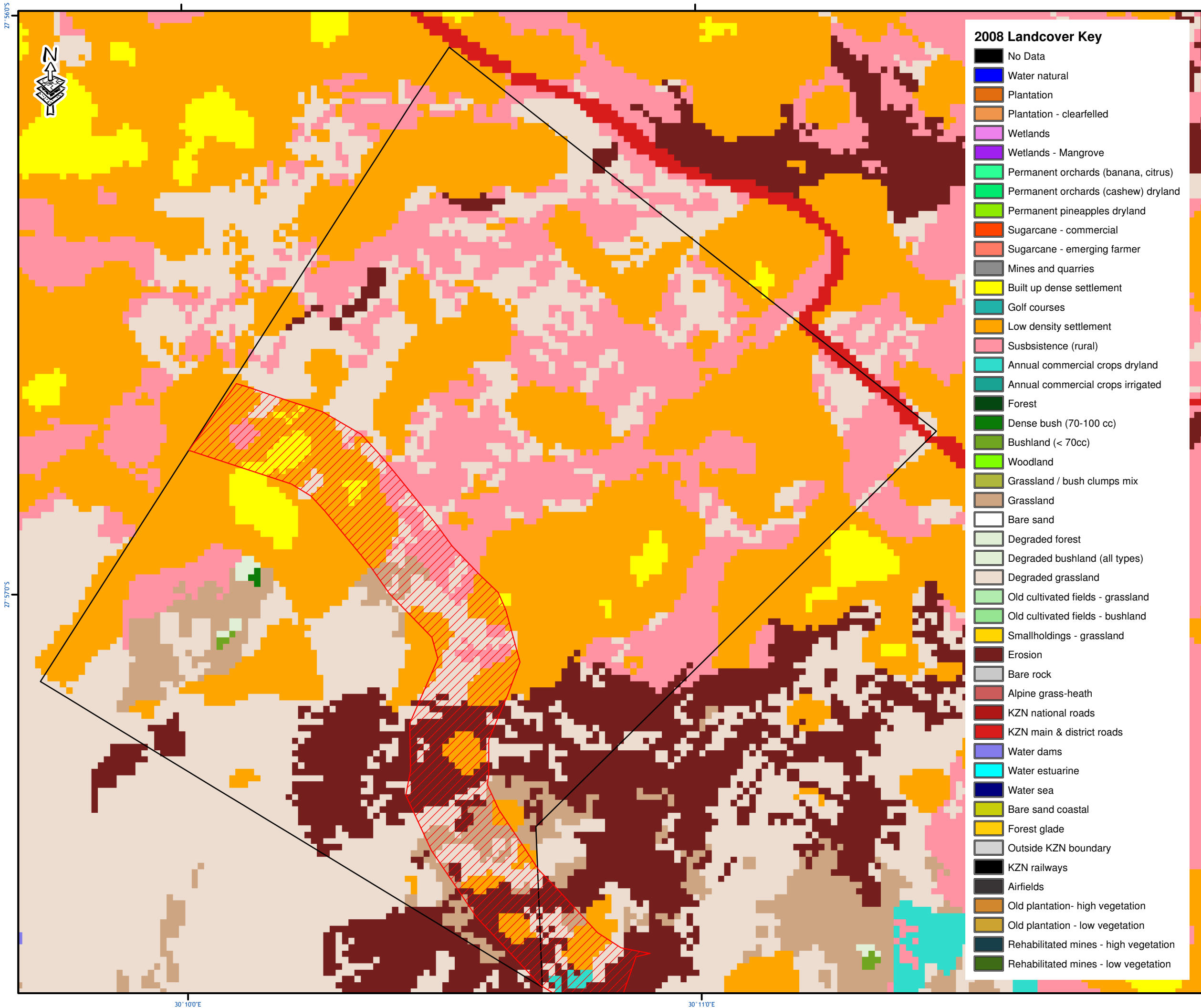



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Figure 6: National Landcover

FIGURE 6: KZN LANDCOVER



2008 Landcover Key

- No Data
- Water natural
- Plantation
- Plantation - clearfelled
- Wetlands
- Wetlands - Mangrove
- Permanent orchards (banana, citrus)
- Permanent orchards (cashew) dryland
- Permanent pineapples dryland
- Sugarcane - commercial
- Sugarcane - emerging farmer
- Mines and quarries
- Built up dense settlement
- Golf courses
- Low density settlement
- Subsistence (rural)
- Annual commercial crops dryland
- Annual commercial crops irrigated
- Forest
- Dense bush (70-100 cc)
- Bushland (< 70cc)
- Woodland
- Grassland / bush clumps mix
- Grassland
- Bare sand
- Degraded forest
- Degraded bushland (all types)
- Degraded grassland
- Old cultivated fields - grassland
- Old cultivated fields - bushland
- Smallholdings - grassland
- Erosion
- Bare rock
- Alpine grass-heat
- KZN national roads
- KZN main & district roads
- Water dams
- Water estuarine
- Water sea
- Bare sand coastal
- Forest glade
- Outside KZN boundary
- KZN railways
- Airfields
- Old plantation- high vegetation
- Old plantation - low vegetation
- Rehabilitated mines - high vegetation
- Rehabilitated mines - low vegetation


Legend

- Proposed OC Workings Expansion
- Study Area

Data Sources:

FIGURE NO.:	6
MAP NUMBER:	13-727/F6-01
DRAWN BY:	R. EDWARDS WETLAND SPECIALIST
REVIEWED BY:	P. LABUSCHAGNE DIRECTOR
DATUM:	WGS84
PROJECTION:	TRANSVERSE MERCATOR
LO:	29
DATE:	NOVEMBER 2013
CLIENT:	FORBES COAL
PROJECT:	MAGDALENA ALLEEN 2 OPEN CAST
SCALE:	1:11 525

0 50 100 200 300 Meters

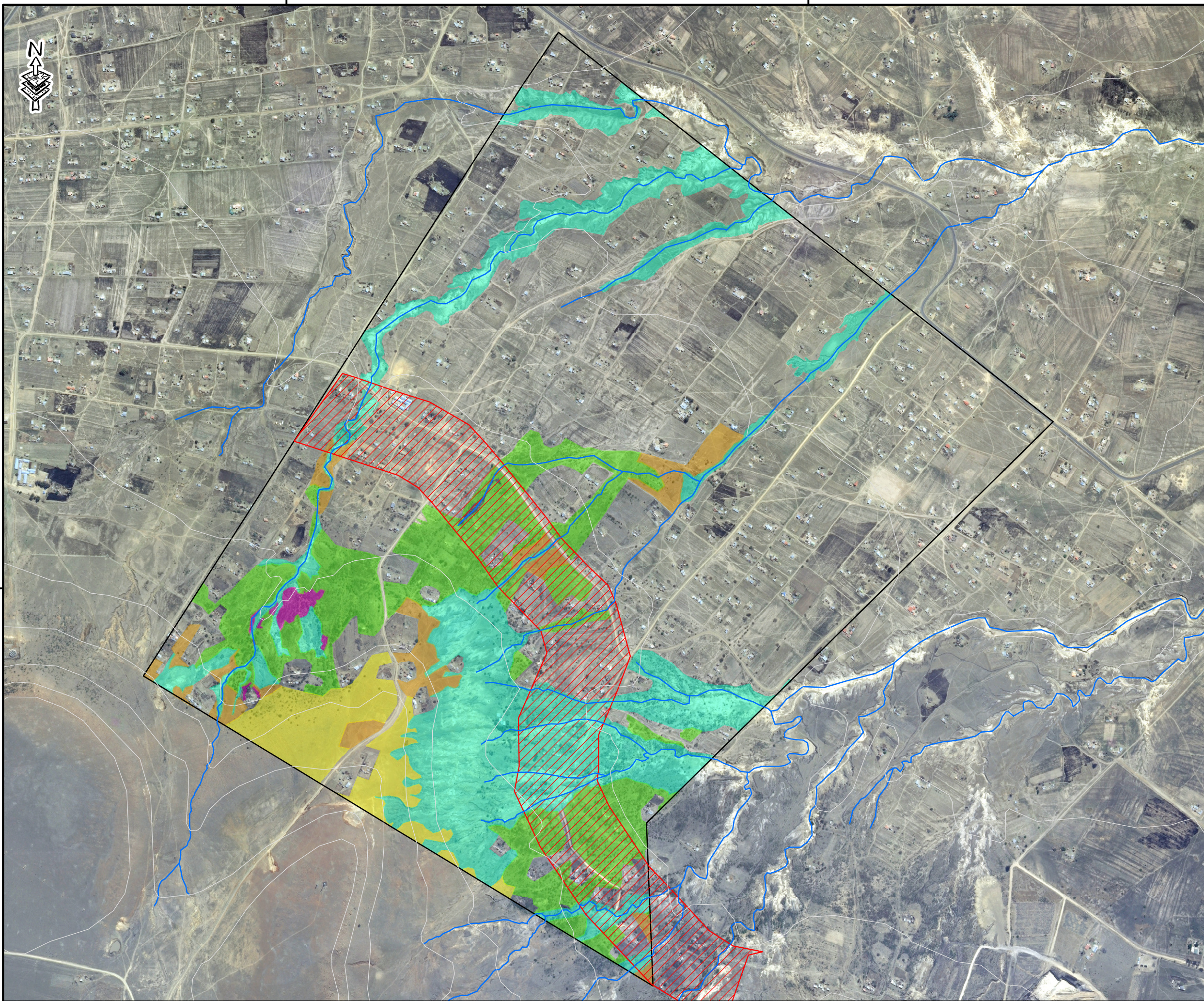


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Figure 7: Desktop Vegetation Communities

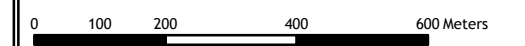
FIGURE 7: DESKTOP VEGETATION COMMUNITIES



- Legend**
- Contours
 - Drainage Lines
 - ▨ Proposed OC Workings Expansion
 - ▭ Study Area
 - Intact Secondary Grassland
 - Eroded Secondary Grassland
 - Eroded Woody Encroached Sec. Grassland
 - Sec. Dense Closed Woody Vegetation
 - Erosion

Data Sources:

FIGURE NO.:	7
MAP NUMBER:	13-727/F7-01
DRAWN BY:	R. EDWARDS WETLAND SPECIALIST
REVIEWED BY:	P. LABUSCHAGNE DIRECTOR
DATUM:	WGS84
PROJECTION:	TRANSVERSE MERCATOR
LO:	29
DATE:	NOVEMBER 2013
CLIENT:	FORBES COAL
PROJECT:	MAGDALENA ALLEEN 2 OPEN CAST
SCALE:	1:11 525




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27° 57'0" S

30° 10'0" E

30° 11'0" E

5.2.3 Floral Species Composition

The climax vegetation type of the site comprises Income Sandy Grassland. The important taxa that occur within this vegetation type are listed in Table 2 below.

Table 2: Income Sandy Grassland Important Taxa (Mucina & Rutherford, 2006)

Taxon Name	Growth Form
<i>Andropogon appendiculatus</i>	Graminoids
<i>Brachiaria serrata</i>	Graminoids
<i>Cynodon dactylon</i>	Graminoids
<i>Digitaria monodactyla</i>	Graminoids
<i>Digitaria tricholaenoides</i>	Graminoids
<i>Eragrostis curvula</i>	Graminoids
<i>Eragrostis gummiflua</i>	Graminoids
<i>Eragrostis plana</i>	Graminoids
<i>Eragrostis racemosa</i>	Graminoids
<i>Heteropogon contortus</i>	Graminoids
<i>Hyparrhenia hirta</i>	Graminoids
<i>Loudetia simplex</i>	Graminoids
<i>Paspalum scrobiculatum</i>	Graminoids
<i>Tristachya leucothrix</i>	Graminoids
<i>Alloteropsis semialata</i> subsp. <i>eckloniana</i>	Graminoids
<i>Andropogon eucomus</i>	Graminoids
<i>Andropogon schirensis</i>	Graminoids
<i>Aristida congesta</i>	Graminoids
<i>Aristida congesta</i>	Graminoids
<i>Aristida junciformis</i> subsp. <i>galpinii</i>	Graminoids
<i>Cymbopogon caesius</i>	Graminoids
<i>Diheteropogon amplexans</i>	Graminoids
<i>Diheteropogon filifolius</i>	Graminoids
<i>Elionurus muticus</i>	Graminoids
<i>Eragrostis capensis</i>	Graminoids
<i>Eragrostis chloromelas</i>	Graminoids
<i>Eragrostis planiculmis</i>	Graminoids
<i>Eragrostis sclerantha</i>	Graminoids
<i>Harpochloa falx</i>	Graminoids
<i>Melinis repens</i> subsp. <i>repens</i>	Graminoids
<i>Microchloa caffra</i>	Graminoids
<i>Monocymbium ceresiiforme</i>	Graminoids
<i>Panicum natalense</i>	Graminoids
<i>Perotis patens</i>	Graminoids
<i>Pogonarthria squarrosa</i>	Graminoids
<i>Setaria nigrirostris</i>	Graminoids
<i>Sporobolus africanus</i>	Graminoids

Taxon Name	Growth Form
<i>Stiburus conrathii</i>	Graminoids
<i>Themeda triandra</i>	Graminoids
<i>Trichoneura grandiglumis</i>	Graminoids
<i>Helichrysum rugulosum</i>	Herbs
<i>Berkheya onopordifolia</i> var. <i>glabra</i>	Herbs
<i>Berkheya setifera</i>	Herbs
<i>Chamaecrista mimosoides</i>	Herbs
<i>Dicoma anomala</i>	Herbs
<i>Dicoma anomala</i>	Herbs
<i>Euryops transvaalensis</i> subsp. <i>setilobus</i>	Herbs
<i>Helichrysum caespititium</i>	Herbs
<i>Helichrysum cephaloideum</i>	Herbs
<i>Helichrysum simillimum</i>	Herbs
<i>Hermannia depressa</i>	Herbs
<i>Hermannia transvaalensis</i>	Herbs
<i>Kohautia amatymbica</i>	Herbs
<i>Kohautia virgata</i>	Herbs
<i>Macledium zeyheri</i> subsp. <i>Argyrophyllum</i>	Herbs
<i>Pentanisia prunelloides</i> subsp. <i>latifolia</i>	Herbs
<i>Senecio coronatus</i>	Herbs
<i>Zornia capensis</i>	Herbs
<i>Zornia capensis</i>	Herbs
<i>Rhynchosia totta</i>	Herbaceous Climber
<i>Rhynchosia totta</i>	Herbaceous Climber
<i>Hypoxis rigidula</i> var. <i>pilosissima</i>	Geophytic Herb
<i>Anthospermum rigidum</i> subsp. <i>pumilum</i>	Low Shrubs
<i>Stoebe plumosa</i>	Low Shrubs

As the site appears to be largely transformed with little natural climax vegetation remaining, it is expected that only a few of the above listed species will be present in the assemblages of the remaining patches of intact secondary grassland communities as shown in **Figure 8**. It is expected that the natural herbaceous diversity of the grassland is substantially reduced and limited.

Information obtained from the SABIS database indicates the known presence of only 210 plant species within the 2730CC QDS. The complete SABIS plant species list for the QDS is included in **Appendix A**.

5.3 Fauna

5.3.1 Birds

The project site occurs within Pentads 2755_3005 and 2755_3010 (**Appendix B**). According to the species lists for these pentads generated as part of the SABAP 2, a total of 66 bird species have been recorded in the local area. However, it is important to note that both the 2755_3005 and 2755_3010 species lists are based on single 2hr atlas in November 2009 by Chris van Rooyen. Therefore, the lists can be considered to be very limited.

5.3.2 Mammals

No mammal records for QDS 2730C are available. The closest QDS with mammal records is 2870CA, which was used as a proxy for the local area because it is of similar vegetation and topography. According to the species lists for QDS 2730CA generated a part of the MammalMap, a total of 5 mammal species are known to occur in the QDS as listed in **Table 3** below.

Table 3: List of mammal species recorded within QDS 2730CA as part of MammalMap

Genus	Species	Common name	Red list category	No. records
<i>Cynictis</i>	<i>penicillata</i>	Yellow Mongoose	Least Concern	4050
<i>Galerella</i>	<i>sanguinea</i>	Slender Mongoose	Least Concern	2025
<i>Lutra</i>	<i>maculicollis</i>	Spotted-necked Otter	Near Threatened	2025
<i>Raphicerus</i>	<i>campestris</i>	Steenbok	Least Concern	2025
<i>Sylvicapra</i>	<i>grimmia</i>	Common Duiker	Least Concern	2025

5.3.3 Reptiles

According to the reptile species lists for QDS 2730CC generated a part of the SARCA, a total of 2 reptile species are known to occur in the QDS. This indicates that the reptile species data for the QDS is limited. For this reason, the list was supplemented with the neighboring QDS 2830AA list as the 2830AA QDS is of similar vegetation and topography. A total of 15 mammal species are known to occur in the local area as listed in **Table 4** below.

Table 4: List of reptile species recorded within QDS 2730CA & 2830AA as part of SARCA

Genus	Species	Common name	Red list category	No. records
<i>Crotaphopeltis</i>	<i>hotamboeia</i>	Red-lipped Snake	Not Evaluated	2025
<i>Hemachatus</i>	<i>haemachatus</i>	Rinkhals	Not Evaluated	4050
<i>Aparallactus</i>	<i>capensis</i>	Black-headed Centipede-eater	Not Evaluated	2025
<i>Chamaeleo</i>	<i>dilepis</i>	Common Flap-neck Chameleon	Not Evaluated	2025
<i>Boaedon</i>	<i>capensis</i>	Brown House Snake	Not Evaluated	2025
<i>Dasypeltis</i>	<i>scabra</i>	Rhombic Egg-eater	Not Evaluated	4050
<i>Lamprophis</i>	<i>aurora</i>	Aurora House Snake	Not Evaluated	2025
<i>Lycodonomorphus</i>	<i>laevissimus</i>	Dusky-bellied Water Snake	Not Evaluated	2025
<i>Lycodonomorphus</i>	<i>rufulus</i>	Brown Water Snake	Not Evaluated	4050
<i>Psammophylax</i>	<i>rhombeatus</i>	Spotted Grass Snake	Not Evaluated	4050
<i>Pseudaspis</i>	<i>cana</i>	Mole Snake	Not Evaluated	4050
<i>Hemachatus</i>	<i>haemachatus</i>	Rinkhals	Not Evaluated	4050
<i>Gerrhosaurus</i>	<i>flavigularis</i>	Yellow-throated Plated Lizard	Not Evaluated	6075
<i>Bitis</i>	<i>arietans</i>	Puff Adder	Not Evaluated	4050
<i>Causus</i>	<i>rhombeatus</i>	Rhombic Night Adder	Not Evaluated	4050

5.3.4 Frogs

According to the species lists for QDS 2730CC generated a part of the SAFAP, a total of 10 frog species are known to occur in the QDS as listed in Table 5 below. This indicates that the frog species data for the QDS is limited. For this reason, the list was supplemented with the neighboring QDS 2830AA list as the 2830AA QDS is of similar vegetation and topography.

Owing to the highly disturbed nature of the site and the poor state of the freshwater ecosystems, as well as the limited diversity of frog habitat, frog diversity is expected to be low and only common hardy and resilient species like the Guttural Toad (*Bufo gutturalis*) can be considered to be present onsite and sensitive and specialized species absent.

Table 5: List of frog species recorded within QDS 2730CC & 2830AA as part of SAFAP

Genus	Species	Red Data Status	Locus	No. of Records
<i>Afrana</i>	<i>angolensis</i>	Least Concern	2730CC	1
<i>Afrana</i>	<i>fuscigula</i>	Least Concern	2730CC	2
<i>Afrana</i>	<i>angolensis</i>	Least Concern	2830AA	6
<i>Breviceps</i>	<i>adpersus</i>	Least Concern	2830AA	2
<i>Bufo</i>	<i>gutturalis</i>	Least Concern	2730CC	1
<i>Bufo</i>	<i>rangeri</i>	Least Concern	2730CC	1
<i>Bufo</i>	<i>gutturalis</i>	Least Concern	2830AA	11
<i>Bufo</i>	<i>rangeri</i>	Least Concern	2830AA	4
<i>Cacosternum</i>	<i>boettgeri</i>	Least Concern	2730CC	1
<i>Cacosternum</i>	<i>boettgeri</i>	Least Concern	2830AA	6
<i>Cacosternum</i>	<i>nanum</i>	Least Concern	2830AA	1
<i>Hemisus</i>	<i>guttatus</i>	Vulnerable	2830AA	1
<i>Hyperolius</i>	<i>marmoratus</i>	Least Concern	2730CC	1
<i>Hyperolius</i>	<i>marmoratus</i>	Least Concern	2830AA	18
<i>Kassina</i>	<i>senegalensis</i>	Least Concern	2730CC	4
<i>Kassina</i>	<i>senegalensis</i>	Least Concern	2830AA	8
<i>Phrynobatrachus</i>	<i>natalensis</i>	Least Concern	2730CC	1
<i>Schismaderma</i>	<i>carens</i>	Least Concern	2830AA	5
<i>Strongylopus</i>	<i>fasciatus</i>	Least Concern	2830AA	3
<i>Tomopterna</i>	<i>natalensis</i>	Least Concern	2730CC	1
<i>Tomopterna</i>	<i>cryptotis</i>	Least Concern	2830AA	4
<i>Tomopterna</i>	<i>natalensis</i>	Least Concern	2830AA	8
<i>Tomopterna</i>	<i>tandyi</i>	Least Concern	2830AA	1
<i>Xenopus</i>	<i>laevis</i>	Least Concern	2730CC	2
<i>Xenopus</i>	<i>laevis</i>	Least Concern	2830AA	1

5.3.5 Invertebrates

Information obtained from the SABIS database indicates the known presence of 130 invertebrate species within the 2730CC QDS. The listed species are all aquatic macro-invertebrates indicating that the species list was likely sourced from aquatic (in-stream) surveys/assessments. Thus, the SABIS list does not provide an indication of the regional and local terrestrial invertebrate species that may be present. The SABIS invertebrate species list for the QDS is included in **Appendix C**.

Owing to the highly disturbed nature of the site and the poor state of the freshwater ecosystems, macro-invertebrate diversity is expected to be low and only common hardy and resilient species can be considered to be present within the limited patches of open water.

The KZN Terrestrial Systematic Conservation Plan (KZN C-Plan) indicates that populations of the millipede *Doratogonus minor* and the mollusc *Cochlitoma simplex* may be present within the site as they are known to occur within the local area. Populations of these two invertebrates may be present in the more intact areas within the study area located upslope of the mining footprint but are likely not present within the actual mining footprint as a result of transformation (see Herbert, 2013 - attached as **Appendix D**).

No butterfly records for QDS 2730C are available. The closest QDS with butterfly records is 2830AA, which was used as a proxy for the local area because it is of similar vegetation and topography. According to the species list for QDS 2830AA generated as part of the SABCA, a total of 44 butterfly species are known to occur in the QDS. The butterfly list is included in **Appendix E**.

5.4 Preliminary Conservation Importance and Sensitivity

5.4.1 Species of Conservation Importance

South Africa uses the internationally endorsed IUCN Red List Categories and Criteria in the Red List of South African plants. This scientific system is designed to measure species' risk of extinction and ultimately highlight those species that are most urgently in need of conservation action.

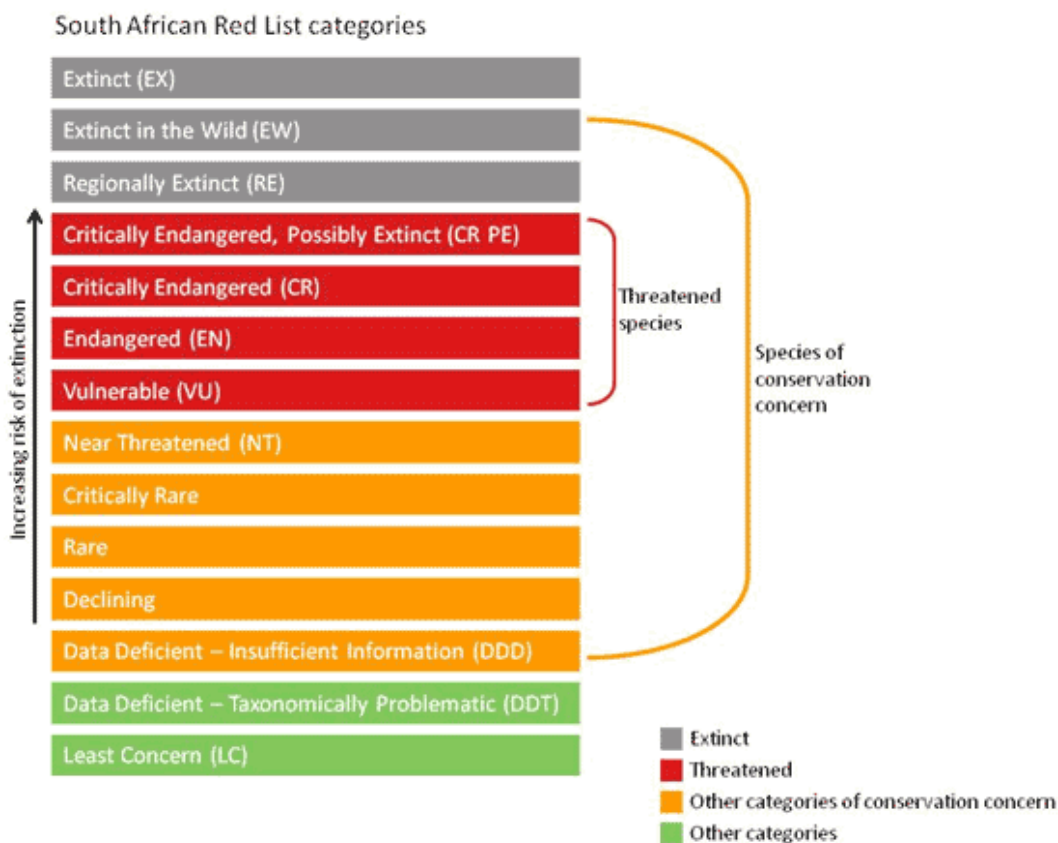
The IUCN Red List categories and criteria are designed to be applied to the entire global range of a species. Such assessments, which take into account the world-wide distribution range of a species, are known as global assessments and are included in the IUCN's international Red List of Threatened Species. However, the system also allows for assessments of geographical subsections of a species' global range. Such subsections are typically marked by a human-defined boundary, such as a country or provincial border. The assessments of such subsections are known as regional assessments, and use the same set of criteria as global assessments. However, if a species is not endemic to the region, the regional assessment procedures contain an additional step to adjust the regional status to allow for the impact of individuals moving between populations within and outside the region on the extinction risk of the species within the region.

Species that are at risk of extinction, also known as threatened or endangered species are those that are classified in the following categories:

- Critically Endangered (CR);
- Endangered (EN); and
- Vulnerable (VU).

The IUCN Red List also includes information on taxa that cannot be evaluated because of insufficient information (i.e. Data Deficient) as well as taxa that are close to meeting the threatened thresholds (i.e. Near Threatened). The complete list of categories is shown in **Figure 8** below.

Figure 8: South African Red List Categories (courtesy of SANBI)



5.4.1.1 Flora

A list of the threatened and protected plant species known to occur within the 2730CC QDS from the SABIS and POSA databases is provided in **Table 6**. Taking cognisance of the habitat that is available as well as the status thereof, it is unlikely that the two threatened plant species are present within the study area, particularly within the proposed mining footprint.

Table 6: Floral species of conservation significance known to occur within the area

Scientific Name	Family	Conservation Status	Habitat Present (Y/N)	LoC*
Herbs:				
<i>Stenostelma umbelluliferum</i>	Milkweed Family	Near-threatened (NT)	N	Unlikely
<i>Habenaria kraenzliniana</i>	Orchid family	Near-threatened (NT)	N	Unlikely

*LoC - Likelihood of occurrence

5.4.1.2 Fauna

Of all the faunal lists and systematic conservation plans interrogated for the QDS and study area, four species of conservation importance may potentially occur onsite. These four species are listed in **Table 7** below along with an indication of whether key habitat is present onsite and their likelihood of occurrence onsite.

Table 7: Faunal species of conservation importance known to occur in the local area

Scientific Name	Common Name	Conservation Status	Habitat Present (Y/N)	LoC*
Birds:				
<i>Falco biarmicus</i>	Lanner Falcon	Near-threatened	N	Possible
Frogs:				
<i>Hemius guttatus</i>	Spotted Shovel-nosed Frog	Vulnerable	N	Unlikely
Invertebrates:				
<i>Doratogonus minor</i>	Minor Black Millipede	Endangered (Endemic)	Y	Possible
<i>Cochlitoma simplex</i>		n/a (Endemic)	Y (Marginal)	Possible

*LoC - Likelihood of occurrence

Although the near-threatened, Lanner Falcon, is known to occur in the area and may utilize the site from time to time, it is unlikely that the remaining intact habitats onsite play an important role in the lifecycles of the local species and/or are critical for the survival of individuals that may use these habitats due to the degraded nature of the site and the presence of human settlement.

Although there are no records of the Spotted Shovel-nosed Frog for QDS 2730CC, there is a single record in the neighboring QDS 2830AA of similar vegetation and topography, and the project site does occur within its resident range. According to the habitat description included on the IUCN website (<http://www.iucnredlist.org/details/55280/0>), the frog “inhabits grassland and savannah. It breeds in seasonal pans, swampy areas, and in pools near rivers. It nests in burrows in wet soil by temporary water, and tadpoles move to water to develop.” As most of the site is highly degraded and the preferred habitats of the frog are absent, it is unlikely that populations of the frog species occur onsite, especially within the transformed areas.

In an ecological survey of the Magdalena Colliery discard dump extension site undertaken by Zunckel Ecological and Environmental Services in June 2013 (ZEES, 2013), the presence of the endemic (not red listed) gastropod, *Cochlitoma simplex*, was confirmed within the property, just north of the study area. Individuals were found on the steep slopes above the current discard dump within the vegetation community labelled ‘steep and rocky encroached grassland’ on site (GPS Co-ordinates: 27° 58'45.33"S & 30° 11'37.42"E) (ZEES, 2013). This type of vegetation appears to be present but limited on the upper slopes of the site, although in a much more degraded state. However, no suitable habitat is present within the proposed mining footprint.

In light of the above, Dr Dai Herbert, a millipede and mollusc specialist, was contacted to provide a formal opinion on the likelihood of occurrence of the snail within the study area and mining footprint. Dr Herbert concluded the following in a letter dated 15 December 2013 attached as **Appendix D**:

“The habitat currently occurring in the footprint of the proposed open cast extension is already highly degraded. Much of it appears to have been settled by the local community and has been cultivated to varying extents. A substantial portion also shows signs of being heavily eroded. It is thus much transformed from its original condition.”

*The same applies to much of the Farm Alleen 2 property. There is an area in the south-west of the property (centered on 27.95048°S: 30.16786°E) that retains what is likely to be scrubby indigenous bush, but this lies within the local community settlement and it is thus likely to be quite extensively grazed and degraded. It is possible that *Cochlitoma simplex* may occur there, particularly if the soils are calcium-rich like those occurring in the vicinity of the proposed mine dump extension, but the long term viability of the population is already probably at considerable risk.*

*Since there is very limited indigenous bushy vegetation in the footprint of the proposed opencast extension and levels of disturbance are high, it cannot be considered a significant habitat for the conservation of *C. simplex*. The same in fact applies to the whole of Farm Alleen 2.”*

In the same ecological survey (ZEES, 2013), evidence of the presence of the threatened (red listed as endangered) millipede, *Doratogonus minor*, could not be found. However, as there is some intact secondary grassland patches present, there is a possibility that the millipede is present within these grassland patches. Nevertheless, no suitable habitat is present within the proposed mining footprint, thus the millipede is unlikely to occur within the proposed mining footprint.

5.4.2 National Ecosystem Conservation Status

In terms of ecosystem conservation status, no listed threatened ecosystems are present within or in the vicinity of the site.

5.4.3 Importance in terms of Biodiversity Protection and Conservation Planning

5.4.3.1 KZN Terrestrial Systematic Conservation Plan

Systematic biodiversity planning, also known as systematic conservation planning, identifies important areas for biodiversity conservation based on three principles:

- The principle of representation, or the need to conserve a representative sample of biodiversity pattern, including ecosystems, habitats and species;
- The principle of persistence, or the need to conserve ecological and evolutionary processes that allows biodiversity to persist over time; and

- The principle of setting explicit biodiversity targets, where each biodiversity feature has quantitative targets set to maintain viable populations and functioning ecosystems, landscapes and seascapes.

In terms of the KZN Terrestrial Systematic Conservation Plan, the northern half of the site is classified as 100% transformed and as such is not important from a conservation planning perspective. The remaining areas within the site are predominantly unclassified and of low conservation importance with two small patches within the eastern and south-eastern parts of the site classified as 'Biodiversity Priority Area 3 - Optimal' (Figure 9). CBA3 indicate the presence of one (or more) features with a low irreplaceability score. In this category, there are alternate sites within which the targets can be met, but there aren't many.

The central-eastern patch is classified as the possible remnants of Income Sandy Grassland and Glencoe Moist Grassland that could potentially host populations of *Doratogonus minor* and *Cochlitoma simplex*. However, a review of the aerial photography indicates that this patch has been transformed by rural development and is of limited conservation importance from a floral and faunal perspective.

The south-eastern patch is classified as the possible remnants of Income Sandy Grassland, Glencoe Moist Grassland and Midland Floodplain Grassland that could potentially host populations of *Doratogonus minor* and *Cochlitoma simplex*. However, a review of the aerial photography indicates that this patch has been disturbed by rural settlement and gully erosion and that the secondary grassland vegetation that remains has undergone woody bush encroachment. Intact secondary grassland is present in the vicinity of CBA3 zone, referred to as 'Intact Secondary Grassland' in sections above.

5.4.3.2 KZN Critical Biodiversity Areas (CBAs) Map

The three main categories used in critical biodiversity area mapping are:

- **Critical Biodiversity Areas (CBAs)** - terrestrial and aquatic features that are crucial for supporting biodiversity features, ecosystem functioning and providing ecological services. CBAs are important for maintaining conservation targets and as such should be retained in a natural state to ensure the continued existence of species and that ecosystem processes and delivery of services from these systems are maintained.

- **Ecological Support Areas (ESAs)** - terrestrial and aquatic areas that are not necessarily important for ensuring that conservation targets are met, however they play a number of important roles in the landscape including; supporting the ecological functions of CBAs, delivering ecological services (e.g. flood attenuation, provision and regulation of river flows carbon sequestration, etc.). Developments within or adjacent to ESAs are only permissible if the land uses allow for the continued functionality of the ESAs.
- **Ecosystem Goods and Service Areas (EGSAs)** - areas wherein life-supporting and essential benefits to humans, from natural processes (ecosystem functions), are derived (Millennium Ecosystem Assessment, 2006). Aquatic EGSAs include all remaining aquatic systems not defined as CBAs and ESAs, both natural (i.e. wetlands and riparian habitat) and artificial systems (e.g. man-made dams and river diversions). All aquatic systems are automatically buffered by 32m.

In terms of the KZN Critical Biodiversity Areas Map, the study area appears to be classified as 'built-up settlement' and 'transformed', and is surrounded by CBA3 areas. There are also important wetlands (EGSAs) to the east of the site associated with the floodplain wetland located at the confluence of the Bloubankspruit and the Buffels River, as well as the greater Buffels River floodplain wetland. It is important to note, however, that because the KZN CBA map is provided a district level jpeg image, it is difficult to accurately position the true location and extent of the study area.

5.4.3.3 South Africa's National Protected Area Expansion Strategy (NPAES)

The goal of the National Protected Area Expansion Strategy (NPAES) is to achieve cost effective protected area expansion for ecological sustainability and adaptation to climate change. The NPAES sets targets for protected area expansion, provides maps of the most important areas for protected area expansion, and makes recommendations on mechanisms for protected area expansion.

A protected area is an area of land that is formally protected by law and managed mainly for biodiversity conservation. Protected areas recognised in the National Environmental Management: Protected Areas Act (Act 57 of 2003) (hereafter referred to as the Protected Areas Act) are considered formal protected areas in the NPAES.

It is important to differentiate protected areas from conservation areas. Conservation areas are areas of land not formally protected by law but informally protected by the current owners and users and managed at least partly for biodiversity conservation. Because there

is no long-term security associated with conservation areas, they are not a strong form of protection and are not considered part of the protected area network. Conservation areas are not a major focus of the NPAES. There are also several forms of statutory protection that are not recognised in terms of the Protected Areas Act but nevertheless provide a degree of protection for the areas and sites concerned. These other forms of statutory protection, also not considered part of the protected area network.

Within the NPAES, focus areas are the areas of land earmarked to be incorporated into the protected areas network in order to meet the NPAES twenty-year targets.

In terms of the NPAES, the project site is located outside of the NPAES and is not earmarked for incorporation into the National protected areas network. The closest formal protected area to the project site is the Chelmsford Nature Reserve located approximately 21km west of the site. The closest focus area is the moist escarpment grasslands on the neighbouring mountain to the west of Mount Johanna located approximately 5.5km west of the site.

5.4.4 Conservation Importance Summary

All of the terrestrial and freshwater habitats that occur within and downstream of the proposed mining footprint appear to be severely degraded and of low to moderately-low ecological importance and conservation value based in the three broad criteria discussed above and summarised in **Table 8** below. Watercourses are by nature sensitive due to the severe pressure that is currently being placed on the country's water resources and as such any destruction of watercourse must not be taken lightly, hence the moderate importance rating.

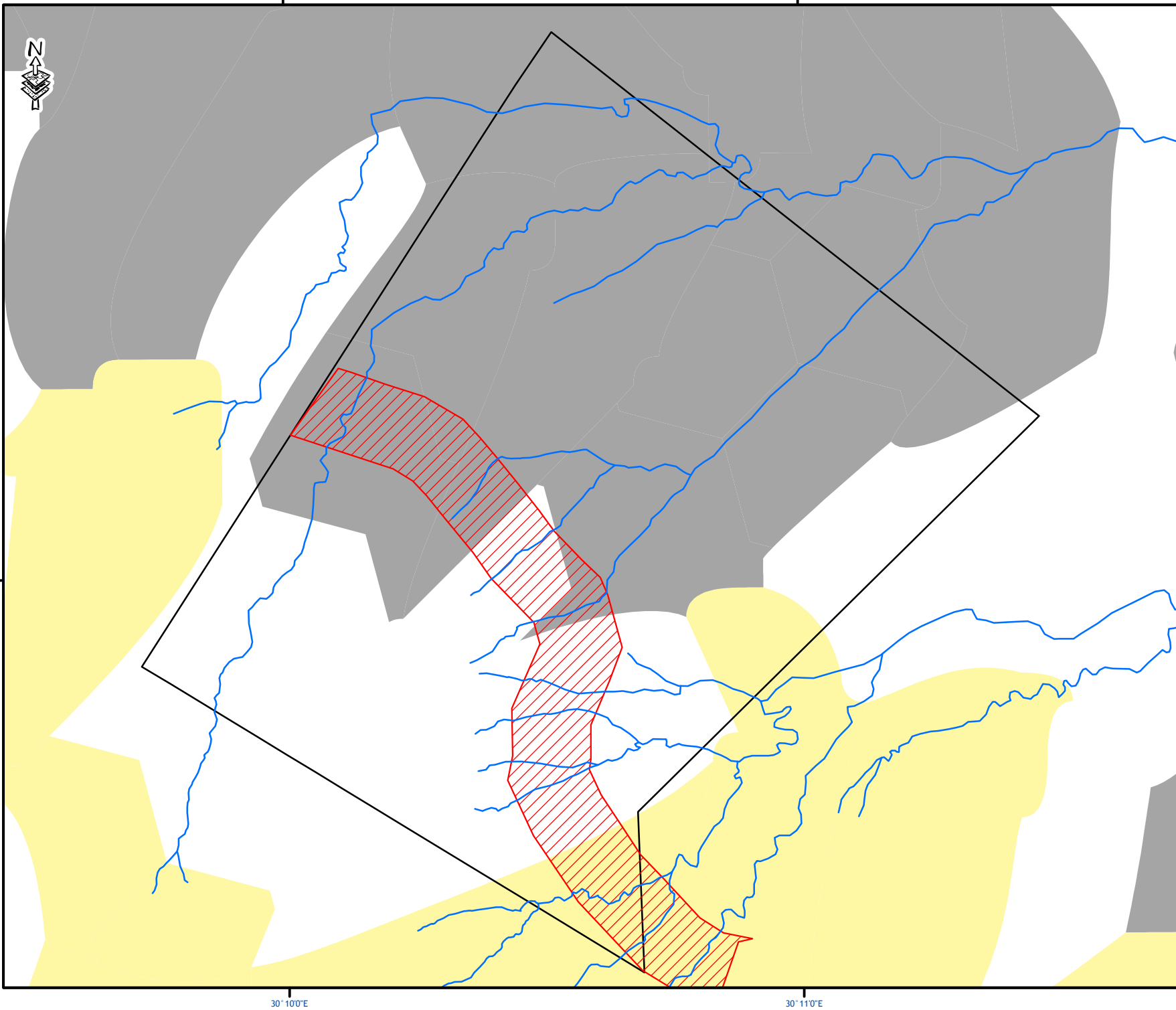
Table 8: Preliminary Rating of Conservation Importance and Sensitivity

Community / Habitat	Possibility of the Presence of Species of Conservation Importance (Y/N)	Threatened Habitat Status (Y/N)	Important to National and/or Provincial Conservation Planning (Y/N)	Preliminary Importance & Sensitivity Rating	Occurs within Mining Footprint (Y/N)
Watercourses	N	N	Y	Moderate	Y
Intact secondary grassland	Y	N	N	Moderate	N
Eroded secondary grassland	N	N	N	Low	Y
Eroded woody	Y	N	N	Moderately-low	Y

Community / Habitat	Possibility of the Presence of Species of Conservation Importance (Y/N)	Threatened Habitat Status (Y/N)	Important to National and/or Provincial Conservation Planning (Y/N)	Preliminary Importance & Sensitivity Rating	Occurs within Mining Footprint (Y/N)
encroached secondary grassland					
Secondary dense closed woody vegetation	Y	N	N	Moderately-low	N
Bare and sparsely vegetated erosion gullies, dongas and channels	N	N	N	Low	Y
Rural settlement and farming areas	N	N	N	Low	Y

Figure 9: KZN Terrestrial Systematic Conservation Plan

FIGURE 9: KZN TERRESTRIAL SYSTEMATIC CONSERVATION PLAN (C-PLAN)



- Legend**
- Drainage Lines
 - Proposed OC Workings Expansion
 - Study Area
 - Existing Protected Area Network
 - 100% Transformed (2005 LC)
 - Outside Province
 - Critical Biodiversity Area 1 Mandatory
 - Critical Biodiversity Area 2 Mandatory
 - Critical Biodiversity Area 3 Optimal
 - Biodiversity Area

Data Sources:

FIGURE NO.:	9
MAP NUMBER:	13-727/F9-01
DRAWN BY:	R. EDWARDS WETLAND SPECIALIST
REVIEWED BY:	P. LABUSCHAGNE DIRECTOR
DATUM:	WGS84
PROJECTION:	TRANSVERSE MERCATOR
LO:	Z9
DATE:	NOVEMBER 2013
CLIENT:	FORBES COAL
PROJECT:	MAGDALENA ALLEEN 2 OPEN CAST
SCALE:	1:16 144

0 100 200 400 600 Meters

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6 PLANNING IMPLICATIONS AND WAY FORWARD

6.1 Freshwater Ecosystem Related Constraints and Requirements

Although the watercourses onsite are severely degraded, the destruction of watercourses is always a significant impact due to the current cumulative impacts on the country's water resources and their inherent sensitivity to hydrological changes. Nevertheless, no freshwater habitats of high importance and sensitivity were found to occur within the mining footprint and thus there appear to no fatal flaws.

It is important to note, however, that the sub-catchment within which the proposed mining extension is planned to occur has been classified as a Fish Support Area in the NFEPA. In terms of management implications, the local Buffels River condition should ideally be improved and alien invasive fish should be removed from Fish Support Areas, so that these sub-quaternary catchments can maintain their fish populations. This doesn't represent a fatal flaw to the project unless proposed mining results in substantial water pollution and channel erosion impacts. The moderate sensitivity of the Buffels River downstream of the site highlights the need to ensure that the impact on the quality and quantity of the flows within the Poonaspruit and Bloubankspruit are minimised by best clean and dirty stormwater management practices. In this regard, every effort should be made to try and work around the larger watercourses where possible.

Furthermore, it is recommended that the most western watercourse within the property and mining footprint be excluded from the mining footprint and afforded a minimum 30m buffer. The reasons for this exclusion being that this watercourse has the largest catchment of all the watercourses to be affected, and has a considerable catchment area upstream of the mining footprint.

6.2 Terrestrial Ecosystem Related Constraints and Requirements

Due to their degraded and secondary nature, the habitats that occur within the proposed mining footprint were assessed as likely being of limited conservation importance. Specialist comment from Dr Herbert (**Appendix D**) confirms the low likelihood of occurrence of the endemic *Cochlitoma simplex* within the habitats occurring within mining footprint. The only habitats of some potential conservation importance are 'intact secondary grassland' and denser woody areas that are outside of the mining footprint. These areas must be avoided. Therefore, based on this preliminary desktop assessment, there are no fatal flaws to the loss of the habitats within the proposed mining footprint from a biodiversity conservation perspective. However, it is recommended that a 'search and rescue' for individuals *Cochlitoma simplex* that may occur within the mining strip be undertaken by a qualified mollusc specialist prior to mining in order to relocate individuals to an appropriate habitat outside of the mining footprint.

7 POTENTIAL IMPACTS AND MITIGATION MEASURES

Ecological impact refers to the effect on a habitat or species due to direct or indirect changes in the environment brought about by a project. Besides magnitude, duration and scale, the significance of an ecological impact is also related to the asserted importance of the habitat or species to be affected. In general, the impact on an important habitat or species will be more significant in comparison to other less important ones.

7.1 Impacts to Freshwater Ecosystems

The five broad potential anticipated impacts to the onsite and downstream freshwater habitats (watercourses) resulting from the construction, operation, closure and post-closure of the proposed open cast expansion are:

- Watercourse direct disturbance and destruction;
- Indirect watercourse disturbance;
- Watercourses erosion, sedimentation and habitat degradation;
- Watercourse flow reduction and habitat degradation; and
- Watercourse pollution.

Each of these potential impacts is discussed briefly below.

7.1.1 Watercourse Destruction and Loss of Ecosystem Services

Nine eroded and degraded watercourses occur within the proposed mining footprint. The mining of these areas will result in the destruction of these watercourses. This will result in the loss of the freshwater ecosystem services provide by the mined portions of the nine watercourses, ultimately contributing to further downstream watercourse degradation. However, due to the current poor state of the watercourses, the level and importance of the ecosystems provided by these watercourses is expected to be low to moderately-low and thus, the direct loss of these portions of watercourses shouldn't have a significant impacts on the integrity of the downstream watercourses.

Recommended Mitigation Measures:

- The most western watercourse within the property and mining footprint should be excluded from the mining footprint and afforded a 30m buffer. In this regard, the 30m buffer zone must be demarcated and marked out by a professional surveyor using barbed wire fencing and danger tape prior to the commencement of the mining operation;
- Wherever possible, mining should be excluded from the watercourses and a small buffer through the breaking up of the open cast extension into segments separated by the watercourses.
- Environmental authorisation and Section 21(c) and (i) water use licenses will be required to disturb/destroy the watercourses.

7.1.2 Indirect Disturbances to Watercourses

Indirect disturbances to freshwater habitats resulting from the open cast activities that will occur during the construction and operational phases include:

- Dust related biotic damage;
- Noise and nuisance disturbances to biota resulting from blasting, excavations, ongoing construction and mining activities, and human presence; and
- Alien invasive plant invasion.

As the watercourses are already highly disturbed and the associated in-stream and riparian habitats are transformed by rural settlement land uses and substantial erosion, the impact of the anticipated indirect disturbances resulting from the proposed open cast extension is likely to not be significant. Nevertheless, in line with good environmental practice, these impacts should be minimised as far as possible.

Recommended Mitigation Measures:

- The approved dust management and suppression measures for the mine must be adopted for the open cast extension.
- The approved noise management and suppression measures for the mine must be adopted for the open cast extension.
- No hunting of any fauna onsite or in the surrounding area is allowed.
- All alien vegetation that starts to re-colonise the open cast mining footprint must be removed immediately. The plants should be hand-pulled and stacked in rows for use in erosion/runoff control.

7.1.3 Erosion, Sedimentation and Habitat Degradation

Watercourse erosion and sedimentation impacts will likely result from the following activities:

Construction Phase:

- Construction disturbances associated with clearing and earthworks activities in close proximity to watercourses;
- Exposure of bare slopes and surfaces that drain directly into the watercourses within the mining footprint;
- Increased discharge velocities at the clean water diversion discharge/inlet points;
- Disturbances during the construction of the watercourse crossings;
- Uncontrolled road stormwater discharges;

Operational Phase:

- Uncontrolled road stormwater discharges;
- Canalisation/concentration of flow through watercourse crossings.
- Increased floodpeaks generated during the overtopping and breaching of the pollution control dams during floods.
- Exposure of bare slopes and surfaces of that drain directly into the watercourses during dismantling and rehabilitation.

Closure Phase:

- The decommissioning of dirty water pollution control dams.
- The decommissioning of the clean water dams.
- The re-instatement of the natural watercourses.

Post-Closure Phase:

- Exposure of poorly vegetated slopes and surfaces where soil stabilisation and re-vegetation was unsuccessful.

- Increased inputs from mine decant water discharges.
- Increased floodpeaks generated during the overtopping and breaching of the retained pollution control dams during floods.

Each of these impacts is discussed briefly below.

During the construction phase, the establishment of infrastructure in close proximity to watercourses could lead to the exacerbation of erosion and sedimentation within the watercourses if poor construction practices are implemented. Similarly, during operation, the exposure of bare slopes and surfaces to the elements will likely lead to rill and gully erosion over time if runoff and erosion control measures are not effectively implemented.

Upstream channelled flow and surface runoff will need to be diverted into artificial drainage channels that ultimately divert flows around the mining footprint and into the channels downstream. Such an activity could have the following potential impacts:

- The erosion of the artificial diversion channels and the resultant sedimentation of the downstream watercourses at the diversion discharge / inlet point;
- Erosion of downstream watercourses at the diversion discharge / inlet point; and
- Sedimentation of the downstream watercourses as a result of erosion at the discharge / inlet point.

Another potential impact to flows is the episodic overtopping of the pollution control dams and/or the breaching of the pollution control dams during flood events which would result in a floodpeak pulse progressing downstream and ultimately significant channel erosion.

As the aquatic and riparian habitats of onsite streams and the downstream Poonaspruit and Bloubankspruit are already severely degraded, the above potential impacts are likely to be significantly reduced and not result in significant changes as long as proper clean and dirty surface water management measures are implemented. Nevertheless, substantial flow alteration to, and erosion of, the downstream watercourses as a result of poor design and implementation of best practice mine surface water management is still unacceptable and must be minimised as far as possible.

Recommended Mitigation Measures:

- Implement surface water runoff and erosion control for the bare slopes and working areas within the dirty and clean water areas.

- For new watercourse crossings, flow must not be canalised and constricted through/under road crossings. Pipe culverts must be established side to side across the width of the watercourse being crossed.
- Stormwater generated by the roads must be discharged back into the environment in a controlled manner to ensure that erosion at these discharge points does not occur. In this regard, many/small outlets must be favoured over few/large and erosion control measures must be established at these outlets e.g. rip-rap or Reno-mattresses.
- Wherever possible, upstream channelled flow should be diverted back into the watercourse from which it was diverted; and
- The discharge of diverted flow back into the watercourses must be done in a controlled manner to ensure that erosion at these discharge/inlet points are minimised. In this regard, energy dissipation measures and/or attenuation measures must be installed.

7.1.4 Flow Reduction and Habitat Degradation

It is best practice water management to contain and capture dirty water generated by the proposed open cast extension in the form of a network of artificial berms and ditches that drain into pollution control dams. However, the downside of such measures is that the dams will capture surface and subsurface flows and effectively remove a portion of the catchment from contributing to streamflow and ultimately reduce streamflows downstream. In addition, the timing and pattern of flows will also be altered through the attenuating effect of the dams. Such flow alteration will likely result in further downstream channel modification as the channels adjust to reduced discharges and peak flow pattern changes. However, the impact of the flow reduction on the integrity of the watercourses is substantially reduced as the watercourses and associated habitats are already highly altered and transformed. Nevertheless, in line with good environmental practice, these impacts should be minimised as far as possible.

Recommended Mitigation Measures:

The size of the dirty water areas should be minimised as far as practically possible.

7.1.5 Water Pollution and In-stream Habitat Degradation

During all phases of the life of the mine (e.g. construction and commissioning, operation, closure and post-closure), the operation of the mine will pose serious water quality risks to the downstream watercourses. These risks/impacts include:

- Oils and hydrocarbon spills and runoff contamination;
- The generation of coal contaminated runoff and seepage from mine infrastructure, processing plant, waste and stockpile areas; and
- Contaminated mine decant water discharges.

These risks are usually reduced through the containment and collection of all the dirty surface and subsurface water onsite through the use of berms, artificial drainage channels and pollution control dams. In addition, the amount of dirty water generated by the mining areas is usually reduced by ensuring that clean water is diverted away from these dirty water areas and re-directed back into the watercourses downstream.

In this case, the major pollutant sources are the pollution control dams themselves through leaking, breaching, overtopping and subsurface seepage if not lined. In addition, acid mine drainage from rehabilitated mine workings is always a risk in the closure and post-closure phases if the pollution control dams are de-commissioned.

Ultimately, the negative impacts of watercourse contamination is the continued degradation of in-stream aquatic habitats downstream and the cumulative water quality and in-stream habitat degradation and biodiversity impacts to the greater Buffels River and Thukela River systems.

Recommended Mitigation Measures:

- The exposure of mined rock to air must be minimised to reduce rock decomposition and oxidation during the open cast operation. In this regard, a geo-hydrologist should be appointed to provide recommendations and mitigation measures.
- A dirty and clean water management plan and a stormwater management plan must be compiled for the project according to the best management practices;
- All pollution control dams must be:
 - Lined to minimise contaminant seepage;
 - Designed to handle (not breach during) 1:50 and 1:100 year flood events;
 - Regularly checked, maintained and serviced; and
- Good housekeeping in terms of spillage and runoff contamination minimisation within the dirty water areas must be strictly implemented to reduce the levels of water contamination.

7.1.6 Cumulative Impacts

The potential cumulative impacts resulting from the above-described impacts combining with the local and regional watercourse impacts are:

- The degeneration of local and regional ecosystem services and degradation of Buffels River hydro-geomorphic and ecological integrity; and
- The degradation of local and regional water quality and in-stream habitat of the Buffels River.

Due to the intensive mining of the Buffels River catchment, the river system is under severe pressure from water pollution and flow alteration impacts. As a result, additional substantial impacts on water quality and quantity could, when combined with all the local impacts, result in a significant impact to freshwater ecosystem integrity. Therefore, it is important to ensure that the mitigation measures recommended above are strictly adhered to.

7.2 Impacts to Terrestrial Ecosystems and Local Biodiversity

The five main potential anticipated impacts to the onsite and downstream freshwater habitats (watercourses) resulting from the construction, operation, closure and post-closure the proposed open cast expansion are:

- Habitat direct disturbance and destruction;
- Indirect habitat disturbance;
- Habitat erosion, sedimentation and degradation;
- Habitat extent reduction and fragmentation; and
- Population impacts.

Each of these potential impacts is discussed briefly below.

7.2.1 Habitat Destruction and Loss

During the site preparation (construction) and operational phase (Rollover) phases, the terrestrial habitats within the mining footprint will be cleared and destroyed. All of the habitats proposed to be lost are secondary and highly degraded so the significance of the direct loss is reduced and low. However, more valuable habitats are located upslope and south-west of the mining footprint, namely the intact secondary grassland and dense woody areas. It is important that direct disturbance impacts to these areas are minimised.

Recommended Mitigation Measures:

- The intact secondary grassland and dense wooded areas outside of the proposed mining footprint must not be cleared and/or disturbed by the mining expansion. In this regard, it is important that the mining footprint be clearly demarcated and marked out by a professional surveyor using bard wire fencing and danger tape prior to the commencement of the mining operation;
- The establishment of new haulage roads must be avoided and existing dirt roads must be utilised as haulage roads; and
- A soil and vegetation rehabilitation plan for the areas to be mined must be prepared by a suitably qualified re-vegetation specialist (botanist/ecologist).
- A 'search and rescue' for individuals *Cochlitoma simplex* that may occur within the mining strip must be undertaken by a qualified mollusc specialist prior to mining. Any individuals found must be relocated to an appropriate habitat outside of the mining footprint.

7.2.2 Indirect Disturbances to Habitat

As described for watercourses above, indirect disturbances to terrestrial habitats resulting from the open cast activities that will occur during the construction and operational phases include:

- Dust related biotic damage;
- Noise and nuisance disturbances to biota resulting from blasting, excavations, ongoing construction and mining activities, and human presence; and
- Alien invasive plant invasion.

As most of the surrounding terrestrial habitats are highly degraded and of low conservation value, the significance of these impacts will likely be low. However, more valuable habitats are located upslope and south-west of the mining footprint, namely the intact secondary grassland and dense woody areas. It is important that the indirect impacts to these areas are minimised.

Recommended Mitigation Measures:

- The approved dust management and suppression measures for the mine must be adopted for the open cast extension.

- The approved noise management and suppression measures for the mine must be adopted for the open cast extension.
- No hunting of any fauna onsite or in the surrounding area is allowed.
- All alien vegetation that starts to re-colonise the open cast mining footprint must be removed immediately. The plants should be hand-pulled and stacked in rows for use in erosion/runoff control.

7.2.3 Erosion, Sedimentation and Degradation

Terrestrial habitat erosion and sedimentation impacts will likely result from the following activities:

Construction phase:

- Exposure of bare slopes and surfaces within the mining footprint;
- Uncontrolled road stormwater discharges;

Operational phase:

- Exposure of bare slopes and surfaced within the mining footprint;
- Uncontrolled road stormwater discharges;

Closure phase:

- Exposure of bare slopes and surfaces during dismantling and rehabilitation;

Post-Closure phase:

- Exposure of poorly vegetated slopes and surfaces where soil stabilisation and re-vegetation was unsuccessful; and
- Increased inputs from mine decant water discharges.

As most of the surrounding terrestrial habitats are already highly eroded and of low conservation value, the significance of these erosion impacts will likely be low. As the more valuable habitats are located upslope and south-west of the mining footprint, further erosion impacts to these areas resulting from the proposed mining extension are likely to be low.

Recommended Mitigation Measures:

- Implement surface water runoff and erosion control for the bare slopes and working areas within the dirty and clean water areas.
- Stormwater generated by the roads must be discharged back into the environment in a controlled manner to ensure that erosion at these discharge points does not occur. In

this regard, many/small outlets must be favoured over few/large and erosion control measures must be established at these outlets e.g. rip-rap or Reno-mattresses.

7.2.4 Habitat Reduction and Fragmentation

The reduction in habitat patch size and the fragmentation of habitat patches are known to disrupt important ecological processes and ultimately result in the reduction in the integrity and viability of ecological systems and habitats. The major cause of patch size reduction and fragmentation is the clearance and transformation of habitats for development. In this case, the habitats within the mining footprint have all largely been transformed by rural development and overgrazing. The intact patches of intact secondary vegetation/habitats that remain are highly fragmented and small in size further contributing to their poor ecological integrity. Therefore, the fragmentation and patch size reduction impacts resulting from the proposed mining operation on the onsite and surrounding habitats will likely be limited.

Recommended Mitigation Measures:

Adhere to recommendations/measures provided in sections above.

7.2.5 Population Impacts

As the habitats onsite are highly degraded and transformed it is expected that the natural floral and faunal populations that would have occurred within these areas have long been transformed, displaced or destroyed. Therefore, the proposed impacts on faunal and floral populations within the mining footprint will likely be of limited significance. However, it is important to note that moderately important floral and faunal populations may be present within the intact secondary grassland and dense secondary wooded areas located upslope of the mining footprint.

Recommended Mitigation Measures:

Adhere to recommendations/measures provided in sections above.

7.2.6 Cumulative Impacts

Typical cumulative impacts to terrestrial ecosystems and biodiversity are:

- Cumulative loss of habitat in the region, province and country.
- Impacts on National and Provincial conservation obligations & targets.

- Cumulative increase in local and regional fragmentation / isolation of habitat.

Due to the highly degraded state of the land proposed to be mined, the significance of the above-listed impacts on local biodiversity and ultimately provincial and national biodiversity goals, targets and plans is likely to be low. As discussed above, the study area is of limited significance in terms of provincial and national biodiversity conservation planning. Therefore, it is anticipated that the cumulative impacts of the proposed operation will be limited.

8 IMPACT ASSESSMENT

The formal assessment of the significance of the impacts on the freshwater ecosystems and habitats as shown in **Table 9** below indicates that most of the impacts on the onsite and local watercourses are of **low significance** with the exception of the cumulative impacts on the Buffels River system being of **medium significance** and generally unacceptable. With the strict adherence to and implementation of the recommended mitigation measures these **medium significance** impacts can be reduced to **medium-low significance**.

Table 9: Freshwater Ecosystem Impact Assessment

POTENTIAL IMPACT	ACTIVITY	PRE-MITIGATION ASSESSMENT								POST-MITIGATION ASSESSMENT							
		Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating	Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating
SITE PREPARATION, CONSTRUCTION AND COMMISSIONING PHASE																	
Direct Disturbance Impacts:																	
1. Clearing, infilling and flooding of watercourses and freshwater habitat for the construction and establishment of the clean water management dams.	Construction and establishment of clean water system dams.	-	5	3	2	5	2	30	L	-	5	3	2	5	2	30	L
2. Clearing, infilling and flooding of watercourses and freshwater habitat for the construction and establishment of the dirty water management dams.	Construction and establishment of dirty water system dams.	-	5	3	2	5	2	30	L	-	5	3	2	5	2	30	L

POTENTIAL IMPACT	ACTIVITY	PRE-MITIGATION ASSESSMENT								POST-MITIGATION ASSESSMENT							
		Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating	Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating
3. Clearing and levelling of watercourses and freshwater habitat within the mining footprint (open cast workings).	Clearing and levelling of mining footprint.	-	5	3	2	5	2	30	L	-	5	3	2	5	2	30	L
4. Clearing and levelling of watercourses and freshwater habitat within the road crossing footprint.	Construction of road crossings.	-	5	3	1	5	2	28	L	-	5	3	1	5	2	28	L
Indirect Disturbance Impacts:																0	
5. Indirect disturbance of neighbouring freshwater habitats as a result of noise and dust pollution, blasting vibrations and increased human presence.	Clearing and levelling of the mining footprint, Blasting, Construction of structures and infrastructure, Materials and person transportation.	-	3	2	2	5	2	24	L	-	2	2	2	5	2	22	L
6. Onsite alien plant proliferation and alien plant invasion of the neighbouring freshwater habitats.	All construction activities.	-	2	2	2	4	2	20	L	-	2	2	2	4	2	20	L
Erosion and Sedimentation Impacts:																	
7. Erosion and sedimentation of watercourses and freshwater habitat resulting from construction disturbances associated with clearing and earthworks activities in close proximity to watercourses.	Clearing and levelling of mining footprint and infrastructure.	-	3	3	2	4	2	24	L	-	2	3	2	3	2	20	L

POTENTIAL IMPACT	ACTIVITY	PRE-MITIGATION ASSESSMENT								POST-MITIGATION ASSESSMENT							
		Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating	Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating
8. Erosion and sedimentation of watercourses and freshwater habitat as a result of the erosion of the bare slopes and surfaces that drain directly into the watercourses within the mining footprint.	Clearing and levelling of mining footprint.	-	3	3	2	4	2	24	L	-	2	3	2	3	2	20	L
9. Erosion and sedimentation of watercourses and freshwater habitat resulting from the increased discharge velocities at the discharge/inlet point.	Operation of clean water management system.	-	3	4	2	4	2	26	L	-	2	3	2	4	2	22	L
10. Erosion and sedimentation of watercourses and freshwater habitat resulting from the construction of the watercourse crossings.	Construction of watercourse crossings.	-	3	4	2	4	2	26	L	-	2	3	2	4	2	22	L
11. Erosion and sedimentation of watercourses and freshwater habitat resulting from the uncontrolled road stormwater discharges.	Road stormwater management.	-	3	3	2	4	2	24	L	-	2	3	2	3	2	20	L
Flow Reduction Impacts:																	
12. Reduction in water inputs and throughflow discharges as a result of the capture and containment of surface and subsurface flows from the clean water areas.	Operation of clean water management system.	-	3	3	2	4	2	24	L	-	3	3	2	4	2	24	L
13. Reduction in water inputs and throughflow discharges as a result of the capture and containment of surface and subsurface flows from the dirty water areas.	Operation of dirty water management system.	-	3	3	2	4	2	24	L	-	3	3	2	4	2	24	L

POTENTIAL IMPACT	ACTIVITY	PRE-MITIGATION ASSESSMENT								POST-MITIGATION ASSESSMENT							
		Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating	Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating
14. Reduction in water inputs and throughflow discharges as a result of the abstraction of water from the dams onsite.	Water abstraction and recycling.	-	2	3	2	4	2	22	L	-	2	3	2	4	2	22	L
Water Quality Impacts:																	
15. Reduction in the water quality of the watercourses as a result of the contamination of clean water areas associated with spillages and leakages of hazardous materials handled and stored onsite.	Hazardous materials dispensing, handling, storage and disposal.	-	4	2	3	3	2	24	L	-	2	2	2	3	2	18	L
16. Reduction in the water quality of the watercourses as a result of the contamination of road runoff that drains into watercourses (hydrocarbon and oil spills).	Operation and maintenance of vehicles and access/haulage roads.	-	4	2	3	3	2	24	L	-	2	2	2	3	2	18	L
Cumulative Impacts:																	
17. Degeneration of local and regional ecosystem services and degradation of Buffels River hydro-geomorphic and ecological integrity.	All construction activities.	-	2	3	3	3	2	22	L	-	2	2	2	3	2	18	L
18. Degradation of local and regional water quality and in-stream habitat of the Buffels River.	All construction activities.	-	2	3	3	3	2	22	L	-	2	2	2	3	2	18	L

POTENTIAL IMPACT	ACTIVITY	PRE-MITIGATION ASSESSMENT								POST-MITIGATION ASSESSMENT							
		Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating	Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating
OPERATIONAL PHASE																	
Indirect Disturbance Impacts:																	
1. Indirect disturbance of neighbouring freshwater habitats as a result of noise and dust pollution, blasting vibrations and increased human presence.	Clearing and levelling of the mining footprint, Blasting, Materials and person transportation.	-	3	2	2	5	2	24	L	-	2	2	2	5	2	22	L
2. Onsite alien plant proliferation and alien plant invasion of the neighbouring freshwater habitats.	All operational activities.	-	2	2	2	4	2	20	L	-	1	2	2	3	2	16	L
Erosion and Sedimentation Impacts:																	
4. Erosion and sedimentation of watercourses and freshwater habitat as a result of the erosion of the bare slopes and surfaces that drain directly into the watercourses within the mining footprint.	Clearing and levelling of mining footprint (Rollover Method)	-	3	3	2	4	2	24	L	-	2	3	2	2	2	18	L
5. Erosion and sedimentation of watercourses and freshwater habitat resulting from the erosion and sedimentation of the clean water artificial drainage channels (erosion of bare surfaces, stockpiles etc.).	Clearing and levelling of mining footprint (Rollover method), Operational of clean water management system.	-	2	3	2	4	2	22	L	-	2	3	2	2	2	18	L
6. Erosion and sedimentation of watercourses and freshwater habitat resulting from the increased discharge velocities at the discharge/inlet point.	Operational of clean water management system.	-	3	3	2	4	2	24	L	-	2	3	2	2	2	18	L

POTENTIAL IMPACT	ACTIVITY	PRE-MITIGATION ASSESSMENT								POST-MITIGATION ASSESSMENT							
		Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating	Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating
7. Erosion and sedimentation of watercourses and freshwater habitat resulting from the canalisation/concentration of flow through watercourse crossings.	Operation of watercourse road crossings.	-	3	3	2	4	2	24	L	-	2	3	3	3	2	22	L
8. Erosion and sedimentation of watercourses and freshwater habitat resulting from the uncontrolled road stormwater discharges.	Road stormwater management.	-	2	3	2	4	2	22	L	-	1	3	2	3	2	18	L
9. Erosion and sedimentation of watercourses and freshwater habitat resulting from the increased floodpeaks generated during the overtopping of the pollution control dams during floods.	Operation of pollution control dams.	-	2	3	3	3	2	22	L	-	2	3	3	3	2	22	L
10. Erosion and sedimentation of watercourses and freshwater habitat resulting from the increased floodpeaks generated during the breaching of the pollution control dams during floods.	Operation of pollution control dams.	-	3	3	3	3	2	24	L	-	3	3	3	2	2	22	L
Flow Reduction Impacts:																	
11. Reduction in water inputs and throughflow discharges as a result of the capture and containment of surface and subsurface flows from the dirty water areas.	Operation of clean water management system.	-	2	3	3	5	2	26	L	-	2	3	3	5	2	26	L

POTENTIAL IMPACT	ACTIVITY	PRE-MITIGATION ASSESSMENT								POST-MITIGATION ASSESSMENT							
		Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating	Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating
12. Reduction in water inputs and throughflow discharges as a result of the abstraction of water from the dams onsite.	Water abstraction and recycling.	-	2	3	2	4	2	22	L	-	2	3	2	4	2	22	L
Water Quality Impacts:																	
13. Reduction in the water quality of the watercourses as a result of the overtopping of the pollution control dams during 1:50 and 1:100 year floods.	Hazardous materials dispensing, handling, storage and disposal.	-	3	3	3	5	2	28	L	-	3	3	3	5	2	28	L
14. Reduction in the water quality of the watercourses as a result of leakages and subsurface seepage from the pollution control dams.	Operation of pollution control dams.	-	3	3	3	3	2	24	L	-	1	3	2	2	2	16	L
15. Reduction in the water quality of the watercourses as a result of the breaching of the pollution control dams during flood events.	Operation of pollution control dams.	-	3	3	3	3	2	24	L	-	3	3	3	2	2	22	L
16. Reduction in the water quality of the watercourses as a result of the contamination of groundwater and seepage by decomposing rock exposed during open cast and underground mining.	Open cast and underground mining, Pit and void dewatering.	-	2	3	3	3	2	22	L	-	2	3	3	3	2	22	L
17. Reduction in the water quality of the watercourses as a result of the contamination of clean water areas associated with spillages and leakages of hazardous materials handled and stored onsite.	Hazardous materials dispensing, handling, storage and disposal.	-	3	3	2	3	2	22	L	-	2	3	2	3	2	20	L

POTENTIAL IMPACT	ACTIVITY	PRE-MITIGATION ASSESSMENT								POST-MITIGATION ASSESSMENT							
		Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating	Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating
18. Reduction in the water quality of the watercourses as a result of the contamination of road runoff that drains into watercourses (hydrocarbon and oil spills).	Operation and maintenance of vehicles and access/haulage roads.	-	3	3	3	3	2	24	L	-	2	3	2	3	2	20	L
Cumulative Impacts:																	
19. Degeneration of local and regional ecosystem services and degradation of Buffels River hydro-geomorphic and ecological integrity.	All operational activities.	-	2	4	3	3	4	48	M	-	1	3	3	3	4	40	M-L
20. Degradation of local and regional water quality and in-stream habitat of the Buffels River.	All operational activities.	-	3	3	3	3	4	48	M	-	1	3	3	3	4	40	M-L
CLOSURE PHASE																	
Direct Disturbance Impacts:																	
1. Disturbances to watercourses and freshwater habitat during the decommissioning of the road watercourse crossings.	Dismantling and removal of watercourse road crossings.	-	3	3	2	4	2	24	L	-	2	2	2	3	2	18	L
2. Disturbances to watercourses and freshwater habitat during the decommissioning of the pollution control dams.	Dismantling and removal of pollution control dams.	-	3	3	2	4	2	24	L	-	2	2	2	3	2	18	L
3. Disturbances to watercourses and freshwater habitat during the upgrading of the pollution control dams to be retained.	Upgrading of the pollution control dams.	-	3	3	2	4	2	24	L	-	2	2	2	3	2	18	L

POTENTIAL IMPACT	ACTIVITY	PRE-MITIGATION ASSESSMENT								POST-MITIGATION ASSESSMENT							
		Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating	Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating
Erosion and Sedimentation Impacts:																	
4. Erosion and sedimentation of watercourses and freshwater habitat as a result of the erosion of the bare slopes and surfaces of that drain directly into the watercourses during dismantling and rehabilitation.	Dismantling and removal of buildings, structures and infrastructure.	-	2	2	2	4	2	20	L	-	2	2	1	3	2	16	L
5. Erosion and sedimentation of watercourses and freshwater habitat as a result of the decommissioning of dirty water pollution control dams.	Dismantling and removal of pollution control dams.	-	2	2	2	4	2	20	L	-	2	2	1	3	2	16	L
6. Erosion and sedimentation of watercourses and freshwater habitat as a result of the decommissioning of the clean water dams.	Dismantling and removal of clean water dams.	-	2	2	2	4	2	20	L	-	2	2	1	3	2	16	L
7. Erosion and sedimentation of watercourses and freshwater habitat as a result of the re-instatement of the natural watercourses.	Watercourse rehabilitation.	-	2	3	2	4	2	22	L	-	2	3	2	3	2	20	L
Water Quality Impacts:																	
8. Reduction in the water quality of the watercourses as a result of the decommissioning of the dirty water pollution control dams.	Dismantling and removal of pollution control dams.	-	3	2	3	3	2	22	L	-	2	2	3	3	2	20	L

POTENTIAL IMPACT	ACTIVITY	PRE-MITIGATION ASSESSMENT								POST-MITIGATION ASSESSMENT							
		Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating	Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating
Cumulative Impacts:								0								0	
9. Degeneration of local and regional ecosystem services and degradation of Buffels River hydro-geomorphic and ecological integrity.	All closure activities.	-	2	2	3	3	4	40	M-L	-	1	2	3	3	4	36	M-L
10. Degradation of local and regional water quality of the Buffels River.	All closure activities.	-	2	2	3	3	4	40	M-L	-	1	2	3	3	4	36	M-L
POST-CLOSURE PHASE																	
Erosion and Sedimentation Impacts:																	
1. Erosion and sedimentation of watercourses and freshwater habitat as a result of the erosion of poorly vegetated slopes and surfaces where soil stabilisation and re-vegetation was unsuccessful.	Post-rehabilitation recovery Rehabilitation Monitoring.	-	3	3	2	4	2	24	L	-	2	3	2	3	2	20	L
2. Erosion and sedimentation of watercourses and freshwater habitat as a result of the increased inputs from mine decant water discharges.	Post-rehabilitation recovery Rehabilitation Monitoring.	-	2	4	2	3	2	22	L	-	2	4	2	3	2	22	L
3. Erosion and sedimentation of watercourses and freshwater habitat resulting from the increased floodpeaks generated during the overtopping of the retained pollution control dams during floods.	Pollution control dam operation monitoring.	-	3	4	2	3	2	24	L	-	2	4	2	3	2	22	L

POTENTIAL IMPACT	ACTIVITY	PRE-MITIGATION ASSESSMENT								POST-MITIGATION ASSESSMENT							
		Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating	Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating
4. Erosion and sedimentation of watercourses and freshwater habitat resulting from the increased floodpeaks generated during the breaching of the retained pollution control dams during floods.	Pollution control dam operation monitoring.	-	3	4	3	3	2	26	L	-	2	4	3	2	2	22	L
Water Quality Impacts:																	
5. Reduction in the water quality of the watercourses as a result of the acid mine drainage/acid rock drainage and mine decant water.	Groundwater and surface water quality monitoring and remediation.	-	3	4	2	3	2	24	L	-	2	4	2	3	2	22	L
6. Reduction in the water quality of the watercourses as a result of the overtopping of the retained pollution control dams during 1:50 and 1:100 year floods.	Pollution control dam operation monitoring, Surface water quality monitoring and remediation.	-	3	4	3	5	2	30	L	-	3	4	3	5	2	30	L
7. Reduction in the water quality of the watercourses as a result of retained pollution control dam leakages and subsurface seepage.	Pollution control dam operation monitoring, Surface water quality monitoring and remediation.	-	3	4	3	3	2	26	L	-	1	4	2	2	2	18	L
8. Reduction in the water quality of the watercourses as a result of the breaching of the retained pollution control dams during flood events.	Pollution control dam operation monitoring, Surface water quality monitoring and remediation.	-	3	4	3	3	2	26	L	-	3	4	3	2	1	12	L

POTENTIAL IMPACT	ACTIVITY	PRE-MITIGATION ASSESSMENT								POST-MITIGATION ASSESSMENT							
		Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating	Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating
Cumulative Impacts:																	
9. Degeneration of local and regional ecosystem services and degradation of Buffels River hydro-geomorphic and ecological integrity.	All post-closure activities.	-	2	4	3	3	4	48	M	-	1	4	2	3	4	40	M-L
10. Degradation of local and regional water quality and in-stream habitat of the Buffels River.	All post-closure activities.	-	3	4	3	3	4	52	M	-	1	4	3	3	4	44	M-L

The formal assessment of the significance of the impacts on the terrestrial ecosystems and habitats as shown in Table 10 below indicates that most of the impacts on the local watercourses are of **low significance** with some of the indirect impacts on surrounding habitats being of **medium-low significance**.

Table 10: Terrestrial Ecosystem Impact Assessment

POTENTIAL IMPACT	ACTIVITY	PRE-MITIGATION ASSESSMENT								POST-MITIGATION ASSESSMENT							
		Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating	Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating
SITE PREPARATION, CONSTRUCTION AND COMMISSIONING PHASE																	
Direct Disturbance Impacts:																	
1. Clearing and destruction of terrestrial habitat for the construction and establishment of the clean water management dams.	Construction and establishment of clean water system dams.	-	5	3	1	5	2	28	L	-	5	3	1	5	2	28	L

POTENTIAL IMPACT	ACTIVITY	PRE-MITIGATION ASSESSMENT								POST-MITIGATION ASSESSMENT							
		Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating	Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating
2. Clearing and destruction of terrestrial habitat for the construction and establishment of the dirty water management dams.	Construction and establishment of dirty water system dams.	-	5	3	1	5	2	28	L	-	5	3	1	5	2	28	L
3. Clearing and destruction of terrestrial habitat within the mining footprint.	Clearing and levelling of mining footprint.	-	5	3	1	5	2	28	L	-	5	3	1	5	2	28	L
4. Clearing and destruction of terrestrial habitat within the access and haulage road footprints.	Access and haulage road construction.		5	3	1	5	2	28	L	-	5	3	1	5	2	28	L
5. Faunal fatalities during habitat clearing and levelling.	Clearing and levelling of mining footprint.	-	5	3	1	5	2	28	L	-	5	3	1	5	2	28	L
Indirect Disturbance Impacts:															0		
6. Indirect disturbance of neighbouring terrestrial habitats as a result of noise and dust pollution, blasting vibrations and increased human presence.	Clearing and levelling of the mining footprint, Blasting, Construction of structures and infrastructure, Materials and person transportation.	-	2	3	2	5	3	36	M-L	-	2	3	2	4	3	33	M-L
7. Onsite alien plant proliferation and alien plant invasion of the neighbouring terrestrial habitats.	All construction activities.	-	2	3	2	4	3	33	M-L	-	1	3	2	3	3	27	L

POTENTIAL IMPACT	ACTIVITY	PRE-MITIGATION ASSESSMENT								POST-MITIGATION ASSESSMENT							
		Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating	Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating
Erosion and Sedimentation Impacts:																	
8. Erosion and sedimentation of terrestrial habitat outside of the mining footprint as a result of the erosion of bare slopes and surfaces within the mining footprint.	Clearing and levelling of mining footprint and infrastructure.	-	3	4	1	4	2	24	L	-	2	3	1	3	2	18	L
9. Erosion and sedimentation of terrestrial habitat outside of the mining footprint as a result of uncontrolled road stormwater discharges.	Road stormwater management.	-	2	4	1	4	2	22	L	-	2	4	1	3	2	20	L
Habitat Reduction & Fragmentation Impacts:																	
10. Reduction in size of local habitats as a result of habitat loss and transformation during clearing and levelling.	Clearing and levelling of mining footprint.	-	3	4	2	4	2	26	L	-	3	4	2	4	2	26	L
11. Fragmentation of local habitat as a result of habitat loss and transformation during clearing and levelling.	Clearing and levelling of mining footprint.	-	2	4	2	4	2	24	L	-	2	4	2	4	2	24	L
Population Impacts:																	
12. Faunal population reduction as a result of fatalities and loss of habitat during site clearing and levelling.	Clearing and levelling of mining footprint.	-	2	3	2	4	2	22	L	-	2	3	2	4	2	22	L
Cumulative Impacts:																	
13. Cumulative loss of habitat in the region, province and country.	All construction activities.	-	2	3	2	3	2	20	L	-	2	3	2	3	2	20	L

POTENTIAL IMPACT	ACTIVITY	PRE-MITIGATION ASSESSMENT								POST-MITIGATION ASSESSMENT							
		Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating	Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating
14. Impacts on National and Provincial conservation obligations & targets.	All construction activities.	-	1	3	2	3	2	18	L	-	1	3	2	3	2	18	L
15. Cumulative increase in local and regional fragmentation / isolation of habitat.	All construction activities.	-	2	3	3	3	2	22	L	-	2	3	3	3	2	22	L
OPERATIONAL PHASE																	
Indirect Disturbance Impacts:																	
3. Indirect disturbance of neighbouring terrestrial habitats as a result of noise and dust pollution, blasting vibrations and increased human presence.	Clearing and levelling of mining footprint (Rollover Method), Blasting, Materials and person transportation.	-	2	3	2	5	3	36	M-L	-	2	3	2	4	3	33	M-L
4. Onsite alien plant proliferation and alien plant invasion of the neighbouring terrestrial habitats.	All operational activities.	-	2	3	2	4	3	33	M-L	-	1	3	2	3	3	27	L
Erosion and Sedimentation Impacts:																	
5. Erosion and sedimentation of terrestrial habitat outside of the mining footprint as a result of the erosion of bare slopes and surfaced within the mining footprint.	Clearing and levelling of mining footprint (Rollover Method)	-	3	4	1	4	2	24	L	-	2	3	1	3	2	18	L
6. Erosion and sedimentation of terrestrial habitat outside of the mining footprint as a result of uncontrolled road stormwater discharges.	Road stormwater management.	-	3	3	1	4	2	22	L	-	2	3	1	3	2	18	L

POTENTIAL IMPACT	ACTIVITY	PRE-MITIGATION ASSESSMENT								POST-MITIGATION ASSESSMENT							
		Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating	Status	Magnitude	Duration	Scale	Probability	Importance	Sig. Points	Sig. Rating
Cumulative Impacts:																	
10. Cumulative loss of habitat in the region, province and country.	All operational activities.	-	2	4	3	3	3	36	M-L	-	1	3	3	3	3	30	L
11. Impacts on National and Provincial conservation obligations & targets.	All operational activities.	-	1	3	2	2	2	16	L	-	1	3	2	2	2	16	L
12. Cumulative increase in local and regional fragmentation / isolation of habitat.	All operational activities.	-	2	3	3	4	2	24	L	-	2	3	3	4	2	24	L
CLOSURE PHASE																	
Erosion and Sedimentation Impacts:																	
1. Erosion and sedimentation of terrestrial habitat as a result of the erosion of the bare slopes and surfaces upslope during dismantling and rehabilitation.	Dismantling and removal of buildings, structures and infrastructure.	-	2	2	1	4	2	18	L	-	1	2	1	3	2	14	L
POST-CLOSURE PHASE																	
Erosion and Sedimentation Impacts:																	
1. Erosion and sedimentation of terrestrial habitat as a result of the erosion of poorly vegetated slopes and surfaces where soil stabilisation and re-vegetation was unsuccessful.	Post-rehabilitation recovery Rehabilitation Monitoring.	-	3	4	1	4	2	24	L	-	2	3	1	3	2	18	L
2. Erosion and sedimentation of terrestrial habitat as a result of the increased inputs from mine decant water discharges.	Post-rehabilitation recovery, Rehabilitation Monitoring.	-	2	4	1	2	2	18	L	-	2	4	1	2	2	18	L

9 CONCLUSION

GCS (Pty) Ltd were appointed by Zinoju to undertake a Basic Assessment for the proposed expansion of the Magdalena Colliery open cast mining operation into Farm Alleen 2. As part of this assessment, GCS ecologists were appointed to undertake a desktop ecological assessment of the site with the purpose of providing an overview of the likely state and importance of the habitats proposed to be impacted, as well as flag any potential fatal flaws to the process.

Being a desktop assessment, a wide range of spatial datasets derived from governmental and non-governmental conservation organisations and departments, as well as the latest colour aerial photography for the site were sampled and utilised to provide a preliminary indication of the characteristics, state and importance of the freshwater and terrestrial habitats onsite. However, it is important to note the limitation and uncertainties associated with such a desktop. The significance of these limitations is reduced by the fact that the ecological areas proposed to be mined are highly degraded and transformed.

An analysis of the available spatial and aerial photography for the study area confirmed the following:

- Nine degraded and incised first-order watercourses occur within the proposed mining footprint;
- The study area occurs within a sub-quaternary catchment classified as a Fish Support Area by the NFEPA;
- Six potential/preliminary vegetation communities/habitats occur within the study area that include:
 - Intact secondary grassland;
 - Eroded secondary grassland;
 - Eroded woody encroached secondary grassland;
 - Secondary dense closed woody vegetation;
 - Bare and sparsely vegetated erosion gullies, dongas and channels;
 - Rural settlement and farming areas;
- With the exception of the 'intact secondary grassland' community, all the vegetation communities were highly degraded and likely of low to moderately-low conservation importance;
- Of the above communities/habitats, only the 'intact secondary grassland' and 'secondary dense closed woody vegetation' units don't occur within the proposed mining footprint;

- Based on the KZN Terrestrial Systematic Conservation Plan and a previous ecological study undertaken for the discard dump extension project in similar habitat south of the study area, there is a possibility that scattered individuals / populations of the red-listed (threatened) millipede, *Doratogonus minor*, and the endemic mollusc, *Cochlitoma simplex*, may be present within the steeper, rocky areas within the intact secondary grassland and woody encroached secondary grassland areas within the study area, despite the high level of habitat degradation. However, it is unlikely that the snail is present within the mining footprint; and
- The study area was found to be of limited importance in terms of national and provincial biodiversity conservation and protected area planning.

In light of these desktop findings, there appear to be no major fatal flaws in terms of impacts to ecology and biodiversity provided that:

- Flow and water quality impacts to downstream freshwater ecosystems are minimised; and
- The more valuable habitats upslope of the mining footprint are not disturbed by the mining activities.

However, it is important to note that despite the degraded state of the onsite and local freshwater and terrestrial habitats, uncontrolled land clearing and mining operations, and the poor management of contaminated dirty water will still likely result in significant cumulative impacts. Thus, it is important that the recommendations provided in **Section 7** are strictly adhered to ensure that ecological impacts are reduced to acceptable levels.

10 REFERENCES

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APPENDICES

Appendix A: SIBIS and POSA Plant Species Lists for 2730CC

SABIS Plants 2730CC

Family	Scientific Name
ACANTHACEAE	Blepharis subvolubilis
ACANTHACEAE	Blepharis integrifolia var. integrifolia
ACANTHACEAE	Blepharis subvolubilis var. longifolia
ACANTHACEAE	Chaetacanthus setiger
AMARANTHACEAE	Alternanthera pungens
AMARANTHACEAE	Alternanthera pungens
AMARANTHACEAE	Gomphrena celosioides
AMARANTHACEAE	Brayulinea densa
AMARYLLIDACEAE	Haemanthus humilis subsp. hirsutus
AMARYLLIDACEAE	Cyrtanthus macowanii
AMARYLLIDACEAE	Haemanthus humilis subsp. hirsutus
AMARYLLIDACEAE	Apodolirion buchananii
ANTHERICACEAE	Chlorophytum fasciculatum
ANTHERICACEAE	Anthericum longistylum
APOCYNACEAE	Periglossum kassnerianum
APOCYNACEAE	Asclepias multicaulis
APOCYNACEAE	Asclepias eminens
APOCYNACEAE	Stenostelma umbelluliferum
APOCYNACEAE	Parapodium costatum
APOCYNACEAE	Asclepias multicaulis
APOCYNACEAE	Periglossum kassnerianum
APOCYNACEAE	Stenostelma eminens
APOCYNACEAE	Asclepias brevicuspis
APOCYNACEAE	Cordylogyne globosa
APOCYNACEAE	Schizoglossum eustegioides
APONOGETONACEAE	Aponogeton junceus subsp. junceus
ASPHODELACEAE	Aloe greatheadii var. davyana
ASPHODELACEAE	Aloe ecklonis
ASTERACEAE	Berkheya onopordifolia var. glabra
ASTERACEAE	Vernonia gerrardii
ASTERACEAE	Hilliardiella oligocephala
ASTERACEAE	Acanthospermum australe
ASTERACEAE	Tripteris aghillana var. aghillana
ASTERACEAE	Schistostephium crataegifolium
ASTERACEAE	Euryops transvaalensis subsp. transvaalensis
ASTERACEAE	Nolletia sp.
ASTERACEAE	Helichrysum dregeanum
ASTERACEAE	Pseudognaphalium luteo-album
ASTERACEAE	Helichrysum dregeanum
ASTERACEAE	Senecio cathcartensis
ASTERACEAE	Helichrysum nigulosum
ASTERACEAE	Chrysocoma mozambicensis
ASTERACEAE	Vernonia gerrardii
ASTERACEAE	Felicia muricata subsp. muricata
ASTERACEAE	Helichrysum caespititium
ASTERACEAE	Helichrysum caespititium
ASTERACEAE	Tripteris aghillana var. aghillana
ASTERACEAE	Denekia capensis
ASTERACEAE	Denekia capensis
ASTERACEAE	Denekia capensis
ASTERACEAE	Denekia capensis
ASTERACEAE	Aster squamatus
ASTERACEAE	Helichrysum callicomum
ASTERACEAE	Nolletia ciliaris
ASTERACEAE	Helichrysum dregeanum
ASTERACEAE	Platycarpha parvifolia
ASTERACEAE	Platycarpha parvifolia
BRASSICACEAE	Rorippa nudiuscula
BRASSICACEAE	Rorippa nudiuscula
BRASSICACEAE	Rorippa nudiuscula
CAPPARACEAE	Cleome monophylla
CAPPARACEAE	Cleome monophylla
CAPPARACEAE	Cleome monophylla
CARYOPHYLLACEAE	Herniaria erckertii subsp. erckertii var. erckertii
CELASTRACEAE	Gymnosporia sp.
CHENOPODIACEAE	Chenopodium pumilio
CHRYSOBALANACEAE	Parinari capensis subsp. capensis
COMMELINACEAE	Commelina subulata
COMMELINACEAE	Cyanotis speciosa

COMMELINACEAE	Commelina subulata
COMMELINACEAE	Commelina subulata
COMMELINACEAE	Commelina benghalensis
COMMELINACEAE	Commelina subulata
COMMELINACEAE	Cyanotis speciosa
COMMELINACEAE	Commelina benghalensis
COMMELINACEAE	Commelina benghalensis
CUCURBITACEAE	Cucumis myriocarpus subsp. leptodermis
CUCURBITACEAE	Cucumis hirsutus
CUCURBITACEAE	Cucumis myriocarpus subsp. myriocarpus
CUCURBITACEAE	Cucumis hirsutus
CYPERACEAE	Pycnus macranthus
CYPERACEAE	Cyperus semitrifidus
CYPERACEAE	Kyllinga erecta var. erecta
CYPERACEAE	Bulbostylis densa subsp. densa
CYPERACEAE	Cyperus longus var. tenuiflorus
CYPERACEAE	Fimbristylis complanata
CYPERACEAE	Schoenoplectus paludicola
CYPERACEAE	Fuirena pubescens var. abbreviata
CYPERACEAE	Pycnus macranthus
EBENACEAE	Diospyros lycioides subsp. guerkei
EBENACEAE	Diospyros whyteana
EUPHORBIACEAE	Phyllanthus maderaspatensis
FABACEAE	Eriosema salignum
FABACEAE	Vigna oblongifolia var. parviflora
FABACEAE	Lessertia thodei
FABACEAE	Eriosema salignum
FABACEAE	Indigofera cryptantha var. cryptantha
FABACEAE	Indigofera torulosa var. torulosa
FABACEAE	Leobordea divaricata
FABACEAE	Argyrolobium sp.
FABACEAE	Leobordea mucronata
FABACEAE	Tephrosia capensis var. capensis
FABACEAE	Tephrosia semiglabra
FABACEAE	Listia heterophylla
FABACEAE	Lessertia sp.
FABACEAE	Alysicarpus rugosus subsp. perennirufus
FABACEAE	Lessertia sp.
FABACEAE	Lessertia sp.
FABACEAE	Medicago laciniata var. laciniata
FABACEAE	Vigna sp.
FABACEAE	Vigna sp.
FABACEAE	Indigofera torulosa var. torulosa
FABACEAE	Argyrolobium sp.
FABACEAE	Argyrolobium sp.
FABACEAE	Indigofera arrecta
FABACEAE	Erythrina zeyheri
FABACEAE	Lotononis mucronata
FABACEAE	Lotononis listii
FABACEAE	Tephrosia capensis var. capensis
FABACEAE	Eriosema salignum
FABACEAE	Tephrosia semiglabra
FABACEAE	Lotononis calycina
FABACEAE	Rhynchosia totta var. totta
GENTIANACEAE	Chironia palustris subsp. palustris
HYACINTHACEAE	Dipcadi marlothii
HYACINTHACEAE	Dipcadi marlothii
HYACINTHACEAE	Ledebouria revoluta
HYDROCHARITACEAE	Lagarosiphon muscoides
HYDROCHARITACEAE	Lagarosiphon muscoides
HYPOXIDACEAE	Hypoxis kraussiana
HYPOXIDACEAE	Hypoxis hemerocallidea
IRIDACEAE	Gladiolus permeabilis subsp. edulis
IRIDACEAE	Hesperantha baurii subsp. baurii
IRIDACEAE	Gladiolus papilio
IRIDACEAE	Gladiolus permeabilis subsp. edulis
JUNCACEAE	Juncus exsertus subsp. exsertus
LAMIACEAE	Stachys hyssopoides
LAMIACEAE	Stachys hyssopoides
LAMIACEAE	Stachys rivularis
LAMIACEAE	Stachys hyssopoides

MALVACEAE	<i>Sida chrysantha</i>
MALVACEAE	<i>Hermannia</i> sp.
MALVACEAE	<i>Hermannia coccocarpa</i>
MALVACEAE	<i>Hermannia oblongifolia</i>
MALVACEAE	<i>Hermannia depressa</i>
MALVACEAE	<i>Corchorus confusus</i>
MALVACEAE	<i>Corchorus</i> sp.
MALVACEAE	<i>Hibiscus microcarpus</i>
MALVACEAE	<i>Sida chrysantha</i>
MOLLUGINACEAE	<i>Limeum viscosum</i>
MOLLUGINACEAE	<i>Limeum viscosum</i> subsp. <i>nummulifolium</i>
OLEACEAE	<i>Menodora africana</i>
ORCHIDACEAE	<i>Habenaria clavata</i>
ORCHIDACEAE	<i>Habenaria kraenzliniana</i>
OROBANCHACEAE	<i>Cycnium adonense</i>
OROBANCHACEAE	<i>Cycnium adonense</i>
OROBANCHACEAE	<i>Striga bilabiata</i> subsp. <i>bilabiata</i>
POACEAE	<i>Microchloa kunthii</i>
POACEAE	<i>Eragrostis heteromera</i>
POACEAE	<i>Eragrostis curvula</i>
POACEAE	<i>Sporobolus africanus</i>
POACEAE	<i>Eragrostis chloromelas</i>
POACEAE	<i>Miscanthus junceus</i>
POACEAE	<i>Hyparrhenia anamesa</i>
POACEAE	<i>Aristida congesta</i> subsp. <i>barbicollis</i>
POACEAE	<i>Andropogon eucomus</i>
POACEAE	<i>Paspalum notatum</i>
POACEAE	<i>Cymbopogon caesius</i>
POACEAE	<i>Digitaria ternata</i>
POACEAE	<i>Paspalum scrobiculatum</i>
POACEAE	<i>Aristida congesta</i> subsp. <i>congesta</i>
POACEAE	<i>Setaria pumila</i>
POACEAE	<i>Arundinella nepalensis</i>
POACEAE	<i>Aristida junciformis</i> subsp. <i>junciformis</i>
POACEAE	<i>Miscanthus junceus</i>
POACEAE	<i>Cynodon dactylon</i>
POACEAE	<i>Eragrostis gummiflua</i>
POACEAE	<i>Trichoneura grandiglumis</i>
POACEAE	<i>Brachiaria eruciformis</i>
POACEAE	<i>Microchloa caffra</i>
POLYGALACEAE	<i>Polygala hottentotta</i>
POLYGALACEAE	<i>Polygala hottentotta</i>
PORTULACACEAE	<i>Talinum caffrum</i>
PORTULACACEAE	<i>Talinum caffrum</i>
RHAMNACEAE	<i>Ziziphus zeyheriana</i>
ROSACEAE	<i>Cliffortia linearifolia</i>
RUBIACEAE	<i>Pygmaeothamnus chamaedendrum</i> var. <i>setulosus</i>
RUBIACEAE	<i>Pygmaeothamnus chamaedendrum</i> var. <i>chamaedendrum</i>
RUBIACEAE	<i>Anthospermum rigidum</i> subsp. <i>pumilum</i>
SCROPHULARIACEAE	<i>Hebenstretia dura</i>
SCROPHULARIACEAE	<i>Scoparia dulcis</i>
SCROPHULARIACEAE	<i>Jamesbrittenia montana</i>
SOLANACEAE	<i>Solanum retroflexum</i>
SOLANACEAE	<i>Solanum panduriforme</i>
SOLANACEAE	<i>Solanum capense</i>
SOLANACEAE	<i>Solanum panduriforme</i>
SOLANACEAE	<i>Solanum retroflexum</i>
SOLANACEAE	<i>Solanum capense</i>
STERCULIACEAE	<i>Hermannia coccocarpa</i>
STERCULIACEAE	<i>Hermannia coccocarpa</i>
STERCULIACEAE	<i>Hermannia oblongifolia</i>
STERCULIACEAE	<i>Hermannia depressa</i>
STERCULIACEAE	<i>Hermannia parviflora</i>
STERCULIACEAE	<i>Hermannia depressa</i>
TILIACEAE	<i>Corchorus confusus</i>
TILIACEAE	<i>Corchorus asplenifolius</i>
TILIACEAE	<i>Grewia hispida</i>
TILIACEAE	<i>Grewia hispida</i>
VAHLIACEAE	<i>Vahlia capensis</i> subsp. <i>vulgaris</i> var. <i>longifolia</i>
VERBENACEAE	<i>Lantana rugosa</i>

POSA 2730CC

Taxon Name	Growth Form	Status
<i>Blepharis integrifolia</i> (L.f.) E.Mey. ex Schinz var. <i>integrifolia</i>	Herb	LC
<i>Blepharis subvolubilis</i> C.B.Clarke	Dwarf shrub, herb, shrub	LC
<i>Alternanthera pungens</i> Kunth	Herb	Not Evaluated
<i>Haemanthus humilis</i> Jacq. subsp. <i>hirsutus</i> (Baker) Snijman	Geophyte	LC
<i>Chlorophytum fasciculatum</i> (Baker) Kativu	Herb	LC
<i>Asclepias eminens</i> (Harv.) Schltr.	Herb	LC
<i>Asclepias meyeriana</i> (Schltr.) Schltr.	Herb	LC
<i>Asclepias multicaulis</i> (E.Mey.) Schltr.	Herb	LC
<i>Gomphocarpus fruticosus</i> (L.) Aiton f. subsp. <i>fruticosus</i>	Herb, shrub	LC
<i>Pachycarpus dealbatus</i> E.Mey.	Herb, succulent	LC
<i>Stenostelma umbelluliferum</i> (Schltr.) S.P.Bester & Nicholas	Geophyte, herb, succulent	NT
<i>Acanthospermum australe</i> (Loefl.) Kuntze	Herb	Not Evaluated
<i>Berkheya onopordifolia</i> (DC.) O.Hoffm. ex Burt Davy var. <i>glabra</i> Bohnen ex Roessler	Herb	LC
<i>Euryops transvaalensis</i> Klatt subsp. <i>transvaalensis</i>	Herb	LC
<i>Helichrysum dregeanum</i> Sond. & Harv.	Dwarf shrub	LC
<i>Pseudognaphalium luteo-album</i> (L.) Hilliard & B.L.Burt	Herb	
<i>Schistostephium crataegifolium</i> (DC.) Fenzl ex Harv.	Herb, suffrutex	LC
<i>Senecio cathcartensis</i> O.Hoffm.	Herb	LC
<i>Vernonia gerrardii</i> Harv.	Herb	LC
<i>Rorippa nudiuscula</i> Thell.	Herb	LC
<i>Cleome monophylla</i> L.	Herb	LC
<i>Parinari capensis</i> Harv. subsp. <i>capensis</i>	Dwarf shrub	LC
<i>Commelina subulata</i> Roth	Helophyte, herb	LC
<i>Cyanotis speciosa</i> (L.f.) Hassk.	Herb, succulent	LC
<i>Cucumis hirsutus</i> Sond.	Herb, succulent	LC
<i>Cucumis myriocarpus</i> Naudin subsp. <i>leptodermis</i> (Schweick.) C.Jeffrey & P.Halliday	Herb	LC
<i>Eriosema salignum</i> E.Mey.	Herb	LC
<i>Indigofera cryptantha</i> Benth. ex Harv. var. <i>cryptantha</i>	Dwarf shrub, shrub	LC
<i>Indigofera torulosa</i> E.Mey. var. <i>torulosa</i>	Herb	LC
<i>Lessertia thodei</i> L.Bolus	Herb	LC
<i>Tephrosia capensis</i> (Jacq.) Pers. var. <i>capensis</i>	Dwarf shrub, herb, shrub	LC
<i>Tephrosia semiglabra</i> Sond.	Herb	LC
<i>Vigna oblongifolia</i> A.Rich. var. <i>parviflora</i> (Baker) Verdc.	Climber, herb	LC
<i>Dipcadi marlothii</i> Engl.	Geophyte	LC
<i>Lagarosiphon muscoides</i> Harv.	Herb, hydrophyte	LC

<i>Gladiolus papilio</i> Hook.f.	Geophyte, herb	LC
<i>Gladiolus permeabilis</i> D.Delaroche subsp. <i>edulis</i> (Burch. ex Ker Gawl.) Oberm.	Geophyte, herb	LC
<i>Hesperantha baurii</i> Baker subsp. <i>baurii</i>	Geophyte, herb	LC
<i>Stachys hyssopoides</i> Burch. ex Benth.	Herb	LC
<i>Corchorus confusus</i> Wild	Herb	LC
<i>Hermannia coccocarpa</i> (Eckl. & Zeyh.) Kuntze	Herb	LC
<i>Hermannia depressa</i> N.E.Br.	Herb	LC
<i>Hermannia oblongifolia</i> (Harv.) Hochr.	Herb	LC
<i>Sida chrysantha</i> Ulbr.	Dwarf shrub	LC
<i>Menodora africana</i> Hook.	Dwarf shrub, herb	LC
<i>Habenaria clavata</i> (Lindl.) Rchb.f.	Geophyte, herb	LC
<i>Habenaria kraenzliniana</i> Schltr.	Geophyte, herb	NT
<i>Cycnium adonense</i> E.Mey. ex Benth.	Herb, parasite	LC
<i>Andropogon eucomus</i> Nees	Graminoid	LC
<i>Aristida congesta</i> Roem. & Schult. subsp. <i>barbicollis</i> (Trin. & Rupr.) De Winter	Graminoid	LC
<i>Aristida congesta</i> Roem. & Schult. subsp. <i>congesta</i>	Graminoid	LC
<i>Aristida junciformis</i> Trin. & Rupr. subsp. <i>junciformis</i>	Graminoid	LC
<i>Arundinella nepalensis</i> Trin.	Graminoid	LC
<i>Digitaria ternata</i> (A.Rich.) Stapf	Graminoid	LC
<i>Eragrostis chloromelas</i> Steud.	Graminoid	LC
<i>Eragrostis curvula</i> (Schrud.) Nees	Graminoid	LC
<i>Eragrostis heteromera</i> Stapf	Graminoid	LC
<i>Hyparrhenia anamesa</i> Clayton	Graminoid	LC
<i>Microchloa kunthii</i> Desv.	Graminoid	LC
<i>Miscanthus junceus</i> (Stapf) Pilg.	Graminoid	LC
<i>Paspalum notatum</i> Flügge	Graminoid	Not Evaluated
<i>Paspalum scrobiculatum</i> L.	Graminoid	LC
<i>Setaria pumila</i> (Poir.) Roem. & Schult.	Graminoid	LC
<i>Sporobolus africanus</i> (Poir.) Robyns & Tournay	Graminoid	LC
<i>Talinum cafferum</i> (Thunb.) Eckl. & Zeyh.	Dwarf shrub, herb, succulent	LC
<i>Cliffortia linearifolia</i> Eckl. & Zeyh.	Shrub	LC
<i>Pygmaeothamnus chamaedendrum</i> (Kuntze) Robyns var. <i>setulosus</i> Robyns	Dwarf shrub	LC
<i>Hebenstretia dura</i> Choisy	Dwarf shrub, shrub	LC
<i>Solanum capense</i> L.	Dwarf shrub, shrub	LC
<i>Solanum retroflexum</i> Dunal	Herb	LC
<i>Lantana rugosa</i> Thunb.	Shrub	LC

Appendix B: SABAP 2 Bird Lists for Pentads

SABAP 2 Bird Lists

Common Name	Scientific Name	Sightings	Reporting Rate
Barbet, Black-collared	<i>Lybius torquatus</i>	1	100.00%
Bishop, Southern Red	<i>Euplectes orix</i>	1	100.00%
Bishop, Yellow-crowned	<i>Euplectes afer</i>	1	100.00%
Bokmakierie, Bokmakierie	<i>Telophorus zeylonus</i>	1	100.00%
Bulbul, Dark-capped	<i>Pycnonotus tricolor</i>	1	100.00%
Bunting, Cinnamon-breasted	<i>Emberiza tahapisi</i>	1	100.00%
Canary, Black-throated	<i>Crithagra atrogularis</i>	1	100.00%
Chat, Anteating	<i>Myrmecocichla formicivora</i>	1	100.00%
Cisticola, Cloud	<i>Cisticola textrix</i>	1	100.00%
Cisticola, Lazy	<i>Cisticola aberrans</i>	1	100.00%
Cisticola, Levaillant's	<i>Cisticola tinniens</i>	1	100.00%
Cisticola, Wing-snapping	<i>Cisticola ayresii</i>	1	100.00%
Cisticola, Zitting	<i>Cisticola juncidis</i>	1	100.00%
Coot, Red-knobbed	<i>Fulica cristata</i>	1	100.00%
Cormorant, Reed	<i>Phalacrocorax africanus</i>	1	100.00%
Crombec, Long-billed	<i>Sylvietta rufescens</i>	1	100.00%
Cuckoo, Diderick	<i>Chrysococcyx caprius</i>	1	100.00%
Cuckoo, Red-chested	<i>Cuculus solitarius</i>	1	100.00%
Dove, Laughing	<i>Streptopelia senegalensis</i>	1	100.00%
Duck, Yellow-billed	<i>Passer melanurus</i>	1	100.00%
Duck, Yellow-billed	<i>Anas undulata</i>	1	100.00%
Egret, Cattle	<i>Bubulcus ibis</i>	1	100.00%
Egret, Little	<i>Egretta garzetta</i>	1	100.00%
Falcon, Lanner	<i>Falco biarmicus</i>	1	100.00%
Fiscal, Common	<i>Lanius collaris</i>	1	100.00%
Flycatcher, Spotted	<i>Muscicapa striata</i>	1	100.00%
Goose, Egyptian	<i>Alopochen aegyptiacus</i>	1	100.00%
Grebe, Little	<i>Tachybaptus ruficollis</i>	1	100.00%
Heron, Grey	<i>Ardea cinerea</i>	1	100.00%
Ibis, African Sacred	<i>Threskiornis aethiopicus</i>	1	100.00%
Ibis, Glossy	<i>Plegadis falcinellus</i>	1	100.00%
Ibis, Hadedda	<i>Bostrychia hagedash</i>	1	100.00%
Lapwing, Blacksmith	<i>Vanellus armatus</i>	1	100.00%
Lark, Rufous-naped	<i>Mirafraga africana</i>	1	100.00%
Longclaw, Cape	<i>Macronyx capensis</i>	1	100.00%
Martin, Banded	<i>Riparia cincta</i>	1	100.00%
Masked-Weaver, Southern	<i>Ploceus velatus</i>	1	100.00%
Mousebird, Red-faced	<i>Urocolius indicus</i>	1	100.00%
Myna, Common	<i>Acridotheres tristis</i>	1	100.00%
Neddicky, Neddicky	<i>Cisticola fulvicapilla</i>	1	100.00%
Paradise-Flycatcher, African	<i>Terpsiphone viridis</i>	1	100.00%
Pipit, African	<i>Anthus cinnamomeus</i>	1	100.00%
Pipit, African	<i>Anthus cinnamomeus</i>	1	100.00%
Plover, Kittlitz's	<i>Charadrius pecuarius</i>	1	100.00%
Plover, Three-banded	<i>Charadrius tricollaris</i>	1	100.00%
Sandpiper, Marsh	<i>Tringa stagnatilis</i>	1	100.00%
Sandpiper, Wood	<i>Tringa glareola</i>	1	100.00%
Seedeater, Streaky-headed	<i>Crithagra gularis</i>	1	100.00%
Shoveler, Cape	<i>Anas smithii</i>	1	100.00%

Sparrow, Cape	<i>Passer melanurus</i>	1	100.00%
Sparrow, Southern Grey-headed	<i>Passer diffusus</i>	1	100.00%
Spoonbill, African	<i>Platalea alba</i>	1	100.00%
Starling, Cape Glossy	<i>Lamprotornis nitens</i>	1	100.00%
Starling, Red-winged	<i>Onychognathus morio</i>	1	100.00%
Sunbird, White-bellied	<i>Cinnyris talatala</i>	1	100.00%
Swift, Horus	<i>Apus horus</i>	1	100.00%
Tchagra, Black-crowned	<i>Tchagra senegalus</i>	1	100.00%
Teal, Red-billed	<i>Anas erythrorhyncha</i>	1	100.00%
Tit-Babbler, Chestnut-vented	<i>Parisoma subcaeruleum</i>	1	100.00%
Turtle-Dove, Cape	<i>Streptopelia capicola</i>	1	100.00%
Wagtail, Cape	<i>Motacilla capensis</i>	1	100.00%
Waxbill, Blue	<i>Uraeginthus angolensis</i>	1	100.00%
Wheatear, Mountain	<i>Oenanthe monticola</i>	1	100.00%
Whydah, Pin-tailed	<i>Vidua macroura</i>	1	100.00%
Widowbird, Long-tailed	<i>Euplectes progne</i>	1	100.00%
Wryneck, Red-throated	<i>Jynx ruficollis</i>	1	100.00%

Appendix C: SIBIS Faunal Species List for 2730CC

SABIS Fauna 2730CC

Family	Scientific Name	
Baetidae	Baetis latus	Invertebrate
Baetidae	Baetis bellus	Invertebrate
Baetidae	Baetis bellus	Invertebrate
Baetidae	Pseudocloeon vinosum	Invertebrate
Baetidae	Centroptilum excisum	Invertebrate
Belostomatidae	Unidentified Belostomatidae	Invertebrate
Caenidae	Unidentified Caenidae	Invertebrate
Caenidae	Unidentified Caenidae	Invertebrate
Caenidae	Unidentified Caenidae	Invertebrate
Caenidae	Unidentified Caenidae	Invertebrate
Caenidae	Unidentified Caenidae	Invertebrate
Caenidae	Unidentified Caenidae	Invertebrate
Ceratopogonidae	Bezzia sp.	Invertebrate
Ceratopogonidae	Bezzia sp.	Invertebrate
Ceratopogonidae	Bezzia sp.	Invertebrate
Ceratopogonidae	Bezzia sp.	Invertebrate
Ceratopogonidae	Culicoides sp.	Invertebrate
Chironomidae	Unidentified Chironomidae	Invertebrate
Chironomidae	Unidentified Chironomidae	Invertebrate
Chironomidae	Unidentified Chironomidae	Invertebrate
Chironomidae	Unidentified Chironomidae	Invertebrate
Chironomidae	Unidentified Chironomidae	Invertebrate
Chironomidae	Unidentified Chironomidae	Invertebrate
Chironomidae	Unidentified Chironomidae	Invertebrate
Chironomidae	Pentaneura sp.	Invertebrate
Chironomidae	Pentaneura sp.	Invertebrate
Chironomidae	Pentaneura sp.	Invertebrate
Chironomidae	Rheotanytarsus sp.	Invertebrate
Chrysomelidae	Sphaeroderma sp.	Invertebrate
Chrysomelidae	Sphaeroderma sp.	Invertebrate
Chrysomelidae	Sphaeroderma sp.	Invertebrate
Clariidae	Clarias sp.	Invertebrate
Coenagrionidae	Pseudagrion salisburyense	Invertebrate
Cyclopidae	Ectocyclops phaleratus	Invertebrate
Cyprinidae	Barbus viviparus	Invertebrate
Diaptomidae	Unidentified Diaptomidae	Invertebrate
Dytiscidae	Unidentified Dytiscidae	Invertebrate
Dytiscidae	Unidentified Dytiscidae	Invertebrate
Dytiscidae	Laccophilus sp.	Invertebrate
Dytiscidae	Laccophilus sp.	Invertebrate
Dytiscidae	Hydaticus sp.	Invertebrate
Dytiscidae	Hydaticus servillianus	Invertebrate
Dytiscidae	Bidessus sp.	Invertebrate
Dytiscidae	Bidessus sp.	Invertebrate
Dytiscidae	Peschetius sp.	Invertebrate
Dytiscidae	Methles sp.	Invertebrate
Dytiscidae	Hydrocoptus sp.	Invertebrate
Elmidae	Unidentified Elmidae	Invertebrate
Elmidae	Leptelmis sp.	Invertebrate

Elmidae	Leptelmis sp.	Invertebrate
Elmidae	Helminthopsis sp.	Invertebrate
Elmidae	Helminthopsis sp.	Invertebrate
Elmidae	Haplelmis sp.	Invertebrate
Ephydriidae	Unidentified Ephydriidae	Invertebrate
Ephydriidae	Unidentified Ephydriidae	Invertebrate
Gyrinidae	Aulonogyrus alternatus	Invertebrate
Gyrinidae	Aulonogyrus alternatus	Invertebrate
Gyrinidae	Orectogyrus sp.	Invertebrate
Gyrinidae	Orectogyrus sp.	Invertebrate
Gyrinidae	Orectogyrus sp.	Invertebrate
Gyrinidae	Aulonogyrus sp.	Invertebrate
Gyrinidae	Aulonogyrus sp.	Invertebrate
Gyrinidae	Aulonogyrus sp.	Invertebrate
Gyrinidae	Aulonogyrus sp.	Invertebrate
Gyrinidae	Aulonogyrus sp.	Invertebrate
Haliplidae	Peltodytes sp.	Invertebrate
Hebridae	Unidentified Hebridae	Invertebrate
Heptageniidae	Notonurus sp.	Invertebrate
Heptageniidae	Notonurus sp.	Invertebrate
Hydrachnidae	Unidentified Hydrachnidae	Invertebrate
Hydrachnidae	Unidentified Hydrachnidae	Invertebrate
Hydrachnidae	Unidentified Hydrachnidae	Invertebrate
Hydrachnidae	Unidentified Hydrachnidae	Invertebrate
Hydrachnidae	Unidentified Hydrachnidae	Invertebrate
Hydraenidae	Unidentified Hydraenidae	Invertebrate
Hydraenidae	Unidentified Hydraenidae	Invertebrate
Hydraenidae	Unidentified Hydraenidae	Invertebrate
Hydraenidae	Unidentified Hydraenidae	Invertebrate
Hydraenidae	Unidentified Hydraenidae	Invertebrate
Hydraenidae	Unidentified Hydraenidae	Invertebrate
Hydraenidae	Unidentified Hydraenidae	Invertebrate
Hydraenidae	Unidentified Hydraenidae	Invertebrate
Hydraenidae	Unidentified Hydraenidae	Invertebrate
Hydraenidae	Unidentified Hydraenidae	Invertebrate
Hydraenidae	Unidentified Hydraenidae	Invertebrate
Hydraenidae	Unidentified Hydraenidae	Invertebrate
Hydraenidae	Unidentified Hydraenidae	Invertebrate
Hydraenidae	Unidentified Hydraenidae	Invertebrate
Hydraenidae	Unidentified Hydraenidae	Invertebrate
Hydraenidae	Unidentified Hydraenidae	Invertebrate
Hydraenidae	Unidentified Hydraenidae	Invertebrate
Hydraenidae	Unidentified Hydraenidae	Invertebrate
Hydridae	Unidentified Hydridae	Invertebrate
Hydrophilidae	Berosus sp.	Invertebrate
Hydrophilidae	Unidentified Hydrophilidae	Invertebrate
Hydrophilidae	Unidentified Hydrophilidae	Invertebrate
Hydrophilidae	Laccobius sp.	Invertebrate
Hydrophilidae	Helochaes sp.	Invertebrate

Hydropsychidae	Unidentified Hydropsychidae	Invertebrate
Hydropsychidae	Amphipsyche sp.	Invertebrate
Hydroptilidae	Unidentified Hydroptilidae	Invertebrate
Hydroptilidae	Unidentified Hydroptilidae	Invertebrate
Hydroptilidae	Unidentified Hydroptilidae	Invertebrate
Hydroptilidae	Hydroptila sp.	Invertebrate
Hydroptilidae	Hydroptila sp.	Invertebrate
Hydroscaphidae	Unidentified Hydroscaphidae	Invertebrate
Leptoceridae	Athripsodes sp.	Invertebrate
Leptoceridae	Triaenodes sp.	Invertebrate
Leptoceridae	Unidentified Leptoceridae	Invertebrate
Leptoceridae	Triaenodes sp.	Invertebrate
Leptoceridae	Triaenodes sp.	Invertebrate
Leptoceridae	Triaenodes sp.	Invertebrate
Leptoceridae	Parasetodes sp.	Invertebrate
Leptoceridae	Parasetodes sp.	Invertebrate
Leptoceridae	Leptocerina sp.	Invertebrate
Macrothricidae	Macrothrix sp.	Invertebrate
Muscidae	Unidentified Muscidae	Invertebrate
Muscidae	Unidentified Muscidae	Invertebrate
Nepidae	Ranatra sp.	Invertebrate
Nepidae	Ranatra sp.	Invertebrate
Pleidae	Plea sp.	Invertebrate
Stratiomyidae	Unidentified Stratiomyidae	Invertebrate
Tipulidae	Unidentified Tipulidae	Invertebrate
Tipulidae	Unidentified Tipulidae	Invertebrate
Unidentified Diptera	Unidentified Diptera	Invertebrate
Veliidae	Unidentified Veliidae	Invertebrate
Veliidae	Microvelia sp.	Invertebrate

Appendix D: Specialist comment on the possible occurrence of *Cochlitoma simplex*

Comment of the possible occurrence of the snail *Cochlitoma simplex* within the Farm Alleen 2 and within the footprint of the proposed opencast mine extension at Magdalena Colliery near Dundee.

by

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Cochlitoma simplex, the Thukela Agate Snail

15 December, 2013

The following observations are based upon the overlays of the farm boundary and the open cast extension footprint (supplied by GCS) onto Google Earth and my own observations having visited the area of the Magdalena Colliery in connection with the biodiversity off-set for the proposed mine dump extension to the south of the existing dump.

The habitat currently occurring in the footprint of the proposed open cast extension is already highly degraded. Much of it appears to have been settled by the local community and has been cultivated to varying extents. A substantial portion also shows signs of being heavily eroded. It is thus much transformed from its original condition.

The same applies to much of the Farm Alleen 2 property. There is an area in the south-west of the property (centered on 27.95048°S: 30.16786°E) that retains what is likely to be scrubby indigenous bush, but this lies within the local community settlement and it is thus likely to be quite extensively grazed and degraded. It is possible that *Cochlitoma simplex* may occur there, particularly if the soils are calcium-rich like those occurring in the vicinity of the proposed mine dump extension, but the long term viability of the population is already probably at considerable risk. Habitat on the adjacent property (centered on 27.95108°S: 30.15185°E) appears to be of much greater extent and in much better condition.

Cochlitoma simplex is rather catholic in its habitat preferences. It will tolerate relatively hot and dry conditions and may occur in relatively open habitats. However, its ability to survive in such harsh environments is dependent upon there being sufficient sheltering microhabitats in which it can seek protection from heat and desiccation. These microhabitats are provided by the bush clumps and small trees which would occur naturally in the area. Where these have been removed and the environment exposed to disturbance (grazing, trampling and crop planting), it is almost certain that *C. simplex* would not be able to survive. Since there is very limited indigenous bushy vegetation in the footprint of the proposed opencast extension and levels of disturbance are high, it cannot be considered a significant habitat for the conservation of *C. simplex*. The same in fact applies to the whole of Farm Alleen 2. Major rehabilitation work would be needed in order to alter this situation.

The conservation of the species in this area would be more effectively addressed by identifying tracts of relatively pristine indigenous vegetation where there are existing populations of the snail and then implementing measures to protect these habitats in a sustainable manner.



15/xii/2013

Appendix E: SABCA Butterfly Species List for 2830AA

SABCA 2830AA

Family	Genus	Species	Subspecies	Common name	Red list category	No. records	Atlas region endemic
HESPERIIDAE	Gegenes	niso	niso	Common hottentot	Least Concern	2025	0
HESPERIIDAE	Kedestes	wallengrenii	wallengrenii	Wallengren's ranger	Least Concern	2025	0
LYCAENIDAE	Actizera	lucida		Rayed blue	Least Concern	2025	0
LYCAENIDAE	Aloeides	swanepoeli		Swanepoel's copper	Least Concern	2025	1
LYCAENIDAE	Anthene	amarah	amarah	Black striped hairtail	Least Concern	2025	0
LYCAENIDAE	Anthene	definita	definita	Common hairtail	Least Concern	2025	0
LYCAENIDAE	Anthene	minima	minima	Little hairtail	Least Concern	2025	0
LYCAENIDAE	Anthene	otacilia	otacilia	Otacilia hairtail	Least Concern	2025	0
LYCAENIDAE	Axiocerses	tjoane	tjoane	Eastern scarlet	Least Concern	2025	0
LYCAENIDAE	Azanus	natalensis		Natal babul blue	Least Concern	8100	0
LYCAENIDAE	Cupidopsis	cissus	cissus	Common meadow blue	Least Concern	4050	0
LYCAENIDAE	Eicochrysops	messapus	mahallakoena	Cupreous blue	Least Concern	4050	0
LYCAENIDAE	Euchrysops	dolorosa		Sabie smoky blue	Least Concern	4050	0
LYCAENIDAE	Lampides	boeticus		Pea blue	Least Concern	4050	0
LYCAENIDAE	Lepidochrysops	ignota		Zulu blue	Least Concern	2025	1
LYCAENIDAE	Lepidochrysops	patricia		Patricia blue	Least Concern	2025	0
LYCAENIDAE	Lepidochrysops	plebeia	plebeia	Twin-spot blue	Least Concern	2025	0
LYCAENIDAE	Leptotes	pirithous	pirithous	Common zebra blue	Least Concern	2025	0
LYCAENIDAE	Lycaena	clarki		Eastern sorrel copper	Least Concern	2025	1
LYCAENIDAE	Myrina	silenus	ficedula	Common fig tree blue	Least Concern	2025	0
LYCAENIDAE	Tarucus	sybaris	sybaris	Dotted blue	Least Concern	4050	0
LYCAENIDAE	Uranothauma	nubifer	nubifer	Black heart	Least Concern	12150	0
LYCAENIDAE	Zintha	hintza	hintza	Hintza pierrot	Least Concern	2025	0
LYCAENIDAE	Zizeeria	knysna	knysna	African grass blue	Least Concern	4050	0
NYMPHALIDAE	Acraea	horta		Garden acraea	Least Concern	2025	0
NYMPHALIDAE	Byblia	ilithyia		Spotted joker	Least Concern	2025	0
NYMPHALIDAE	Catacroptera	cloanthe	cloanthe	Pirate	Least Concern	4050	0
NYMPHALIDAE	Charaxes	brutus	natalensis	White-barred charaxes	Least Concern	2025	0
NYMPHALIDAE	Danaus	chrysippus	orientis	African monarch, Plain tiger	Least Concern	4050	0
NYMPHALIDAE	Junonia	hierta	cebrene	Yellow pansy	Least Concern	4050	0
NYMPHALIDAE	Precis	archesia	archesia	Garden commodore	Least Concern	4050	0

NYMPHALIDAE	Precis	octavia	sesamus	Gaudy Commodore	Least Concern	8100	0
NYMPHALIDAE	Telchinia	rahira	rahira	Marsh acraea	Least Concern	4050	0
NYMPHALIDAE	Vanessa	cardui		Painted lady	Least Concern	4050	0
NYMPHALIDAE	Ypthima	asterope	asterope	African ringlet	Least Concern	4050	0
NYMPHALIDAE	Ypthima	impura	paupera	Impure ringlet	Least Concern	4050	0
PAPILIONIDAE	Papilio	demodocus	demodocus	Citrus swallowtail	Least Concern	4050	0
PAPILIONIDAE	Papilio	nireus	lyaeus	Green-banded swallowtail	Least Concern	2025	0
PIERIDAE	Belenois	aurota		Brown-veined white	Least Concern	4050	0
PIERIDAE	Colotis	euipe	omphale	Smoky orange tip	Least Concern	2025	0
PIERIDAE	Eronia	cleodora		Vine-leaf vagrant	Least Concern	2025	0
PIERIDAE	Eurema	brigitta	brigitta	Broad-bordered grass yellow	Least Concern	8100	0
PIERIDAE	Eurema	desjardinsii	regularis	Angled grass yellow	Least Concern	2025	0
PIERIDAE	Eurema	hecabe	solifera	Lowveld yellow	Least Concern	2025	0