TERRESTRIAL VEGETATION ASSESSMENT

FOR THE PROPOSED UPGRADE OF IKHETHELO HIGH SCHOOL SITUATED IN VRYHEID, ABAQULUSI LOCAL MUNICIPALITY, ZULULAND DISTRICT, KWA-ZULU NATAL

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Specialist Details & Declaration

This report has been prepared in accordance with Section 13: General Requirements for Environmental Assessment Practitioners (EAPs) and Specialists as well as per Appendix 6 of GNR 982 – Environmental Impact Assessment Regulations and the National Environmental Management Act (NEMA, No. 107 of 1998 as amended 2017) and Government Notice 704 (GN 704). It has been prepared independently of influence or prejudice by any parties.

The details of Specialists are as follows –

Table 1 Details of Specialist

Specialist	Task	Qualification and accreditation	Client	Signature
Bruce Scott-Shaw NatureStamp	Fieldwork & report	PhD, Hydrology	iNhlaba Consulting	 Date: 18/12/2020
Ross Goode	Fieldwork & Taxonomy	Diploma	iNhlaba Consulting	 Date: 18/12/2020

Details of Authors:

Ross Goode is a vegetation ecologist with years of experience in the field. He is well known in the grassland ecology community and spends most of his time identifying grass species and implementing fire management plans. Ross has undertaken projects throughout the country including the Kruger

National Park and most of northern KwaZulu-Natal. Ross is involved in training staff for fire burning regimes. He also has a close relationship with tertiary education units through which he has co-authored scientific papers.

Bruce is a hydrologist, whose focus is broadly on hydrological perspectives of land use management and climate change. He completed his MSc under Prof. Roland Schulze in the School of Bioresources Engineering and Environmental Hydrology (BEEH) at the University of KwaZulu-Natal, South Africa. Throughout his university career he has mastered numerous models and tools relating to hydrology, soil science and GIS. Some of these include ACRU, SWAT, ArcMap, Idrisi, SEBAL, MatLab and Loggernet. He has some basic programming skills on the Java and CR Basic platforms. Bruce completed his PhD at the Center for Water Resources Research (UKZN), which focused on rehabilitation of alien invaded riparian zones and catchments using indigenous trees. Bruce is currently affiliated to the University of KwaZulu-Natal where he is a post-doctoral student where he runs and calibrates hydrological and soil erosion models. Bruce has presented his research around the world, including the European Science Foundation (Amsterdam, 2010), COP17 (Durban, 2011), World Water Forum (Marseille, 2012), MatLab advanced modelling (Luxembourg, 2013), World Water Week (Singapore, 2014), Forests & Water, British Colombia, (Canada, 2015), World Forestry Congress (Durban, 2015), Society for Ecological Restoration (Brazil, 2017). Conservation Symposium (Howick, South Africa, 2018) and SWAT modelling in Siem Reap (Cambodia, 2019). As a consultant, Bruce is the director and principal hydrologist of NatureStamp (PTY) Ltd. In this capacity he undertakes flood studies, calculates hydrological flows, performs general hydrological modelling, stormwater design, dam designs, wetland assessments, water quality assessments, groundwater studies and soil surveys.

1. INTRODUCTION

1.1 Project Background and Description of the Activity

iNhlaba Consulting is in the Screening Phase of the proposed upgrading design and construction management of Ikhethelo High School situated in Vryheid, Kwa-Zulu Natal. The coordinates of the school site are: 27°59'47.42"S; 30°43'35.85"E

Upgrades of the following facilities are required:

- Administration Block (Block A);
- Lower grade classroom block (Block B);
- All ablution blocks (Block E, G & H) – The removal of asbestos roofing is to be done in accordance with the requirements of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993);
- Teachers' cottage (Block I);
- Guardhouse – demolition and reconstruction (Block J); and
- Combi court to accommodate multiple sporting codes.

Additionally, the following new facilities are proposed:

- SNP & Team-teaching block;
- Refuse area;
- Covered walkways between the internal blocks; and
- Covered parking.

The presence of flora is of vital importance in maintaining ecological diversity and ecosystem health. Indicator species are species which tend to decrease in presence and diversity when the ecological state of the system is under pressure. Additionally, species of conservation concern and Red Data species are protected on a provincial, national and international level and the presence of such species needs to be verified.

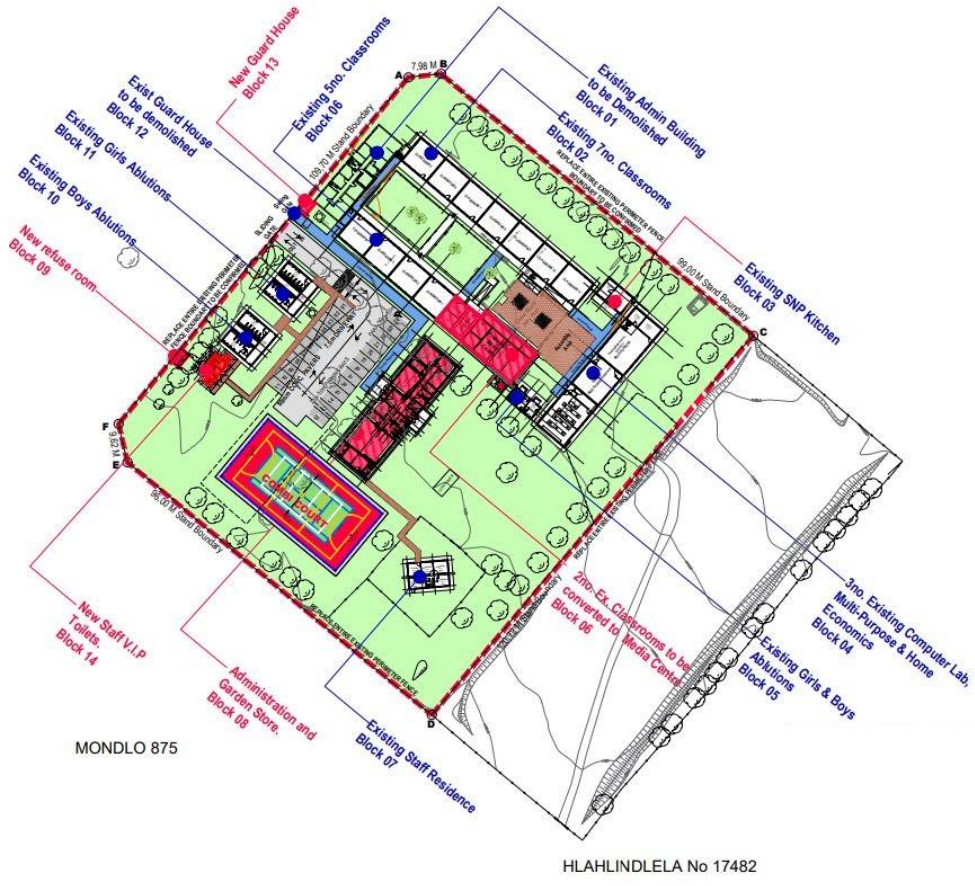

Figure 1 Layout of the amendments to Ikhethelo school

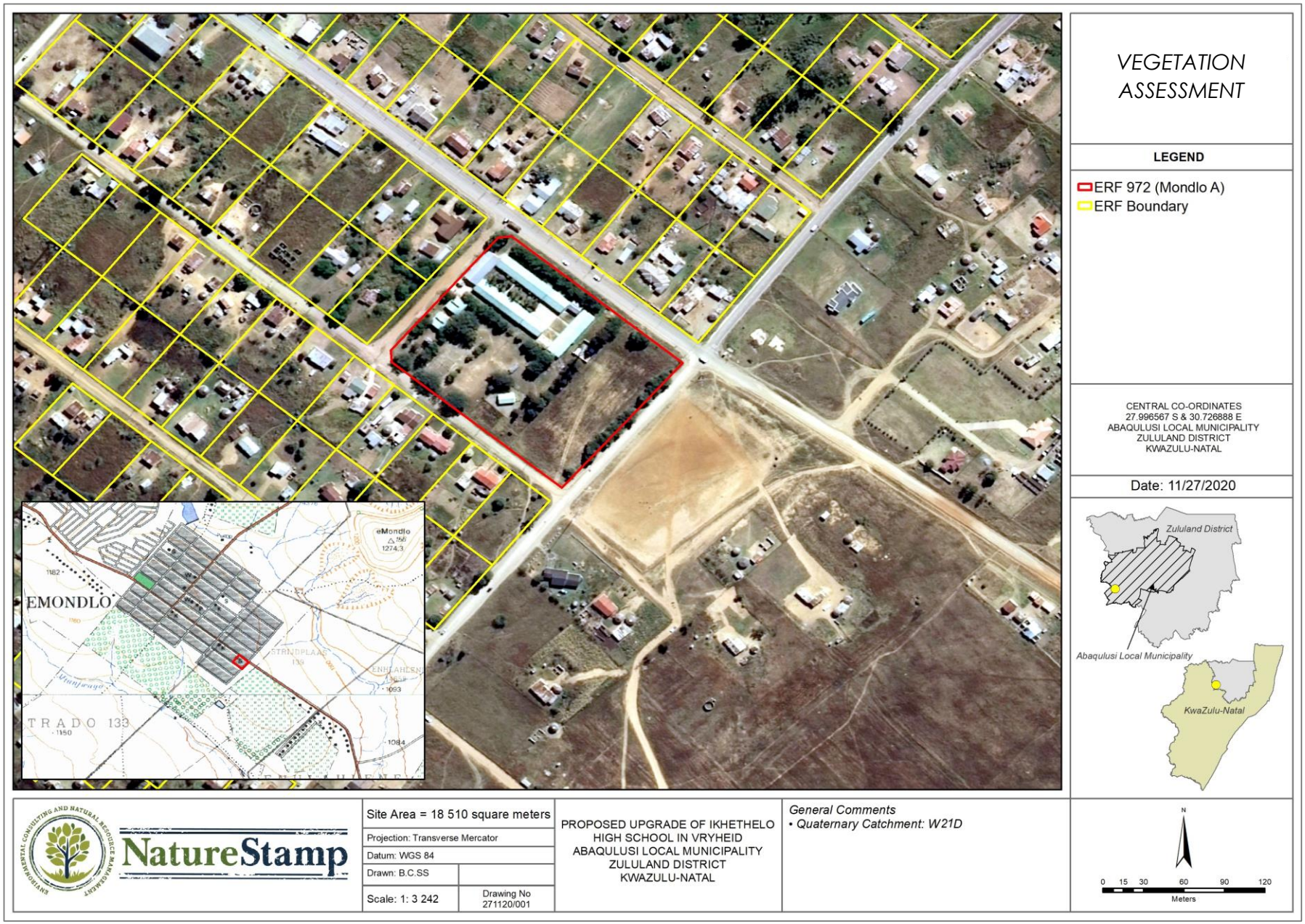

Figure 2 Location of Ikhethelo school

1.2 Terms of Reference

i. Terrestrial Vegetation Assessment

a. Species Environmental Assessment to be undertaken under Best Practice Guideline referred to in the protocols published under Government Notice No. 9 in Government Gazette No. 42946 on 10 January 2020
b. A desktop assessment of the site will be undertaken using the latest Google Earth imagery and aerial photography, as well as the databases that have been generated from various sources such as Mucina & Rutherford and the Bioresource Programme for vegetation.
c. Sensitivity mapping will be conservation planning information obtained from the South African National Biodiversity Institute (SANBI) datasets, which represents priority areas for biodiversity conservation.
d. The above information will inform the assessment and identify any vegetation "hotspots" that will require a detailed assessment.
e. A site visit to ground-truth the data accumulated through the desktop assessment will be undertaken.
f. A herbaceous survey will be undertaken that will evaluate the botanical composition and ecological status of the site.
g. All data gathered will be collated into a report with representative maps, including plant species lists.
h. Recommendations will be provided regarding the development potential of the site, including relevant environmental legislation.
i. Compile a report with all findings, including mapping of sensitive ecological areas.

1.3 Legislation Guiding this Assessment

There are a number of regulations and legislation governing this report and are listed below: The relevant sections are found in greater detail in Appendix 1.

- National Environmental Management Act, Act 108 of 1998 (NEMA) as amended in 2014
- National Forests Act (Act No. 84 of 1998)
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
- Conservation of Agricultural Resources (Act No. 43 of 1983) As Amended in 2001

National Environmental Management Act, Act No. 107 of 1998 (NEMA)

NEMA requires, *inter alia*, that:

- *"Development must be socially, environmentally, and economically sustainable",*
- *"Disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied."*
- *"A risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions",*

NEMA also states that;

"The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage."

National Forests Act (Act No. 84 of 1998)

According to this act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that;

"No person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister."

Any disturbance, removal, pruning or transplanting of this species would require a licence from the administrators of the National Forests Act, who are an extension of the Department of Agriculture, Forestry and Fisheries (DAFF) based in Pietermaritzburg.

The National Forests Act of 1998 (as amended) provides the strongest and most comprehensive legislation and mandate for the protection of all natural forests in South Africa. The principles of the Act in Section 3 state clearly that "…natural forests may not be destroyed save in exceptional circumstances where, in the opinion of the Minister, a proposed new land use is preferable in terms of its economic, social or environmental benefits". This prescribes that no development affecting forests may be allowed unless "exceptional circumstances" can be proven. Section 7 of the Act prohibits the cutting, disturbance, destruction or removal of any indigenous living or dead tree in a forest without a licence, while Section 15 places a similar prohibition on protected tree species listed under the Act, some of which are also forest species.

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

In terms of the Biodiversity Act, the developer has a responsibility for:

- *The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations).*
- *Promote the application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all development within the area are in line with ecological sustainable development and protection of biodiversity.*
- *Limit further loss of biodiversity and conserve endangered ecosystems.*

2. STUDY SITE

The site is located within Quaternary Catchment W21D; falling under the Usutu/Phongolo/Mfolozi Water Management Area (WMA) and not managed by a waterboard. The proposed area sits in the upper catchment area of the Mvunyane with modified by land use practices. The site is within the greater catchment area of the White Mfolozi system. The catchment area is highly susceptible to erosion as was evident during the site visit.

Rainfall in the Mondlo region occurs in the summer months (mostly December to February), with a mean annual precipitation of 635 mm (observed from rainfall station 0372296 W). The reference potential evaporation (ET_o) is approximately 1800 mm (A-pan equivalent, after Schulze, 2011) and the mean annual evaporation is between 1400 – 1500 mm, which exceeds the annual rainfall. This suggests a high evaporative demand and a water limited system. Summers are warm to hot and winters are cool. The mean annual temperature is approximately 21 °C in summer and 12 °C in the winter months (Table 2). The underlying geology of the site is dominated by Pietermaritzburg shale and Vryheid Arenite/shale. The soils overlain are sandy-clay ranging from Glenrosa to Longlands form in this particular area.

Table 2 Mean monthly rainfall and temperature observed at Mondlo (derived from historical data)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Mean Rainfall (mm)	108.1	83.5	71.8	31.8	12.4	12.5	12.2	22.3	34.0	76.8	83.9	95.2	**635**
Mean Temperature (°C)	21.4	20.3	17.9	14.9	12.2	12.2	14.4	17.3	18.2	19.6	20.8	21.1	**17.6**

Figure 3 Typical setting around the existing school area

3. METHODOLOGY

The assessment can be broken down into two sections, a desktop assessment and site verification.

Databases allow for the rapid assessment of species which are predicted to occur in an area. These databases are compiled using verified citizen science observations, as well as correlating species and their habitat requirements and assigning the result to a habitat type. This results in species predicted for an area. This may often result in a wide paucity in data as no previous observations have been made in an area, resulting in no predicted data for that species in that area. This means that verification of faunal data is essential in filling in gaps that may occur at desktop level.

A site visit was conducted on the 15th December 2020 to conduct necessary in-field procedures to verify the presence of flora within the study area.

3.1 Desktop assessment

A number of databases have been interrogated in the process of undertaking the Desktop Analysis (found in greater detail in Appendix 2), these include:

- Ezemvelo KwaZulu-Natal Wildlife's C-Plan (Conservation Plan) and SEA (Strategic Environmental Assessment);
- Department of Agriculture's (1998) Bioresource Classification for Kwazulu-Natal, South Africa;
- Department of Environmental Affairs and Tourisms (2007) the Environmental Potential Atlas (ENPAT);
- Mucina and Rutherford's Vegetation Assessment (2007);
- Ezemvelo KwaZulu-Natal Wildlife's KwaZulu-Natal Vegetation Types (KZN VT);
- National Freshwater Ecosystem Priority Areas (NFEPA) (2010)

3.1.1 Critically Biodiverse Areas

Critical Biodiversity Areas (CBAs) can be divided into two subcategories, namely Irreplaceable and Optimal. Each of these can in turn be subdivided into additional subcategories. The CBA categories are based on the optimised outputs derived using systematic conservation planning software, with the Planning Units (PU) identified representing the localities for which the conservation targets for one or more of the biodiversity features contained within can be achieved.

3.1.2 Ezemvelo KZN wildlife (C-Plan & SEA Database)

The C-Plan is a systematic conservation-planning package that consists of metadata within a shapefile, used by ArcGIS (or similar tool), which analyses biodiversity features and landscape units. C-Plan is used to identify a national reserve system that will satisfy specified conservation targets for biodiversity features (Lombard *et al*, 2003). These units or measurements are ideal for areas which have not been sampled. The C-Plan is an effective conservation tool when determining priority areas at a regional level and is being used throughout South Africa to identify areas of conservation value. Some of this information extends into the Eastern Cape.

The Strategic Environmental Assessment (SEA, 2000) Plan is a database of the modelled distribution of a selection of red data and endemic species that could, or are likely, to occur in an area.

3.1.3 Protected and conservation areas of South Africa

The Department of Environmental Affairs (DEA) have released an online map tool detailing the protected areas and associated 5km buffer. The site does not fall within the 5 km buffer of Nature Reserves nor the 10 km buffer of special protected areas/World Heritage Sites.

3.1.4 Bio Resource Units (BRU)

A Bioresource Unit is a demarcated area in which the environmental conditions such as soil, vegetation, climate and, to a lesser degree, terrain form, are sufficiently similar to permit uniform recommendations of land use and farm practices to be made, to assess the magnitude of crop yields that can be achieved, to provide a framework in which an adaptive research programme can be carried out, and to enable land users to make correct decisions (Camp, 1998).

The environmental factors defined in a BRU should give an indication of habitat suitability for both plant and animal species. On the other hand, knowing the habitat requirements of any particular species, it should be possible to map locations suitable for such species. There are 590 BRUs in KwaZulu-Natal.

3.2 Vegetation Sampling

A flora sampling assessment was undertaken on the 15th December 2020. The ERF and its surrounds were assessed and individual plant species observed during the assessment were recorded. Given the small site and the site visit undertaken, the procedure proposed for this study was satisfactory for providing a general overview and assessment of the plant diversity and assemblages that occur on site. This methodology allows sufficient information to be gathered to make the necessary inferences as to the ecological state of the receiving environment and to assess the possible impacts that may be imparted as a result of the proposed activities as well as the provision for rehabilitation recommendations and landscape management plans.

3.3 Invasive Alien Plant (IAP) Classification

CATEGORY 1a

Invasive species must be **combatted or eradicated**. They may not be owned, grown, moved, sold, given as a gift or dumped in watercourses. There are several very common plant species in his category, such as *Ageratum* spp. (Billygoat-Weed), *lantana camara* (Tick Berry), *Ipomoea spp*. (morning glory), *Cinnanomun camphora* (camphor tree) and *Cardiospernum grandiflorum* (balloon vine).

A person in control of a Category 1a species must-

- comply with the provisions of section 73(2) of the Act;
- immediately take steps to combat or eradicate listed invasive species in compliance with sections 75(1), (2) and (3) of the Act; and
- allow an authorised official from the Department to enter onto land to monitor, assist with or implement the combatting or eradication of the listed invasive species.
- If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must combat or eradicate the listed invasive species in accordance with such programme.

CATEGORY 1b

Invasive species which must be **controlled.** Any form of trade or planting is strictly prohibited.

A person in control of a Category 1b species must-

- control the listed invasive species in compliance with sections 75(1), (2) and (3) of the Act.
- If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme.
- A person contemplated in sub-regulation (2) must allow an authorised official from the Department to enter onto the land to monitor, assist with or implement the control of the listed

Category 2

Invasive species, or species deemed to be potentially invasive, which **require a permit**, as relates to restricted activities (planting / propagating) within an area specified in the Notice or an area specified in the permit,

as the case may be. Category 2 species include commercially important species such as pine, wattle and gum tree. These may remain in a garden, but only with a permit, which is granted under very few circumstances.

- Unless otherwise indicated in the Notice, no person may carry out a restricted activity in respect of a Category 2 Listed Invasive Species without a permit.
- A landowner on whose land a Category 2 Listed Invasive Species occurs or person in possession of a permit, must ensure that the specimens of the species do not spread outside of the land or the area specified in the Notice or permit.
- If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme.
- Unless otherwise specified in the Notice, any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area contemplated in sub-regulation (1), must, for purposes of these regulations, be considered to be a Category 1 b Listed Invasive Species and must be managed according to Regulation 3.
- Notwithstanding the specific exemptions relating to existing plantations in respect of Listed Invasive Plant Species published in Government Gazette No. 37886, Notice 599 of 1 August 2014 (as amended), any person or organ of state must ensure that the specimens of such Listed Invasive Plant Species do not spread outside of the land over which they have control.

CATEGORY 3

Invasive species which are **subject to exemptions** and which may remain in prescribed areas or provinces.

- Any plant species identified as a Category 3 Listed Invasive Species that occurs in riparian areas, must, for the purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to regulation 3.
- If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme.

4. LIMITATIONS AND ASSUMPTIONS

In order to apply generalized and often rigid scientific methods or techniques to natural, dynamic environments, a number of assumptions are made. Furthermore, a number of limitations exist when assessing such complex ecological systems. The following constraints may have affected this assessment –

- Flora that may be dormant during the site visit, such as bulbs, may have not been identified on-site and does not necessarily mean that the species does not occur there. As such, various databases are used in assisting the specialist in establishing species presence.
- A thorough vegetation identification exercise was undertaken. This report should be read in conjunction with the watercourse report (NatureStamp, 2020).

5. RESULTS AND DISCUSSION

The following results were used as input to the selected models and have been provided here.

5.1 Desktop Assessment

A number of databases have been interrogated in the process of undertaking the Desktop Analysis (found in greater detail in Appendix 2), these include:

- Ezemvelo KwaZulu-Natal Wildlife's C-Plan (Conservation Plan) and SEA (Strategic Environmental Assessment);
- Department of Agriculture's (1998) Bioresource Classification for Kwazulu-Natal, South Africa;
- Department of Environmental Affairs and Tourisms (2007) the Environmental Potential Atlas (ENPAT);
- Mucina and Rutherford's Vegetation Assessment (2007);
- Ezemvelo KwaZulu-Natal Wildlife's KwaZulu-Natal Vegetation Types (KZN VT);
- National Freshwater Ecosystem Priority Areas (NFEPA) (2010)

A summary of the methodology utilised for the generation of each of the databases are included in Appendix B for further interest. Below are the results of the Desktop assessment:

5.1.1 Strategic Environmental Assessment (SEA), Conservation Plan (C-Plan) and Critical Biodiversity Areas

There are limited features and species within the features present within the footprint which are considered to be of conservation importance. These are included in Table 3. During the site visit and subsequent ground truth, it was noted that the site was heavily modified.

Table 3 Minset/C-Plan data (Ezemvelo KZN Wildlife)

Species	Type
Doratogonus minor	*Millipede*

In terms of the desktop analysis undertaken, no parts of the site is considered **irreplaceable**, i.e. these planning units are referred to as totally irreplaceable and the conservation of the features within them is critical to meet conservation targets. The actual state of the site is completely transformed (Figure 4). There are no wetlands on site. The site is considered **transformed**.

Figure 4 Already transformed state of the proposed development site

The CBA data indicates that the proposed school upgrade site was found to be transformed, and hence does not exhibit Income Sandy Grassland vegetation composition, but instead mostly pioneer and alien vegetation plant species interspersed.

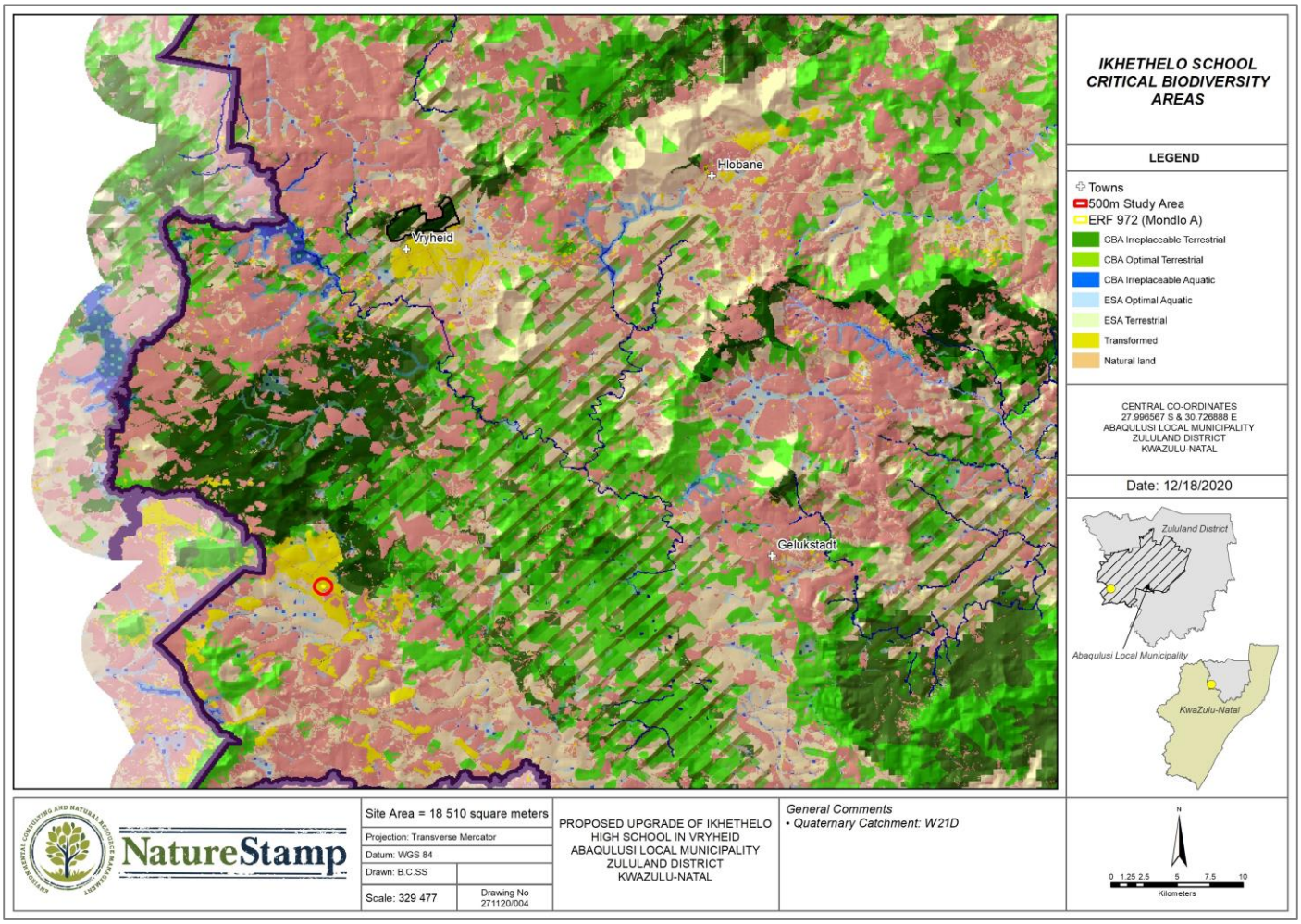

Figure 5 CBA map for the proposed school upgrade site

5.1.2 Vegetation- Mucina and Rutherford

The vegetation on site comprises of Income Sandy Grassland (Gs 7: Mucina & Rutherford, 2006; Scott-Shaw & Escott, 2011). The desktop analysis revealed that the area is vulnerable and is hardly protected with 73 % remaining habitat. The following information was collected for the vegetation unit GS 7 (Mucina & Rutherford, 2006; Scott-Shaw & Escott, 2011):

- **Distribution:** KwaZulu-Natal Province: KwaZulu-Natal Province: In a large triangle between Newcastle, Vryheid and Dundee and larger polygon in the Wasbank area in northern KwaZulu-Natal.

- **Altitude:** 880–1 340 m (mainly 1 120–1 240 m).

- **Vegetation and Landscape features:** Very flat extensive areas with generally shallow, poorly drained, sandy soils supporting low, tussock-dominated sourveld forming a mosaic with wooded grasslands (with *Acacia sieberiana var woodii*) and on well-drained sites with the trees *A. karroo, A. nilotica, A. caffra* and *Diospyros lycoides*. On disturbed sites *A. sieberiana var woodii* can form sparse woodlands. *Aristida congesta, Cynodon dactylon* and *Microchloa caffra* are common on shallow soils (Camp 1999b).

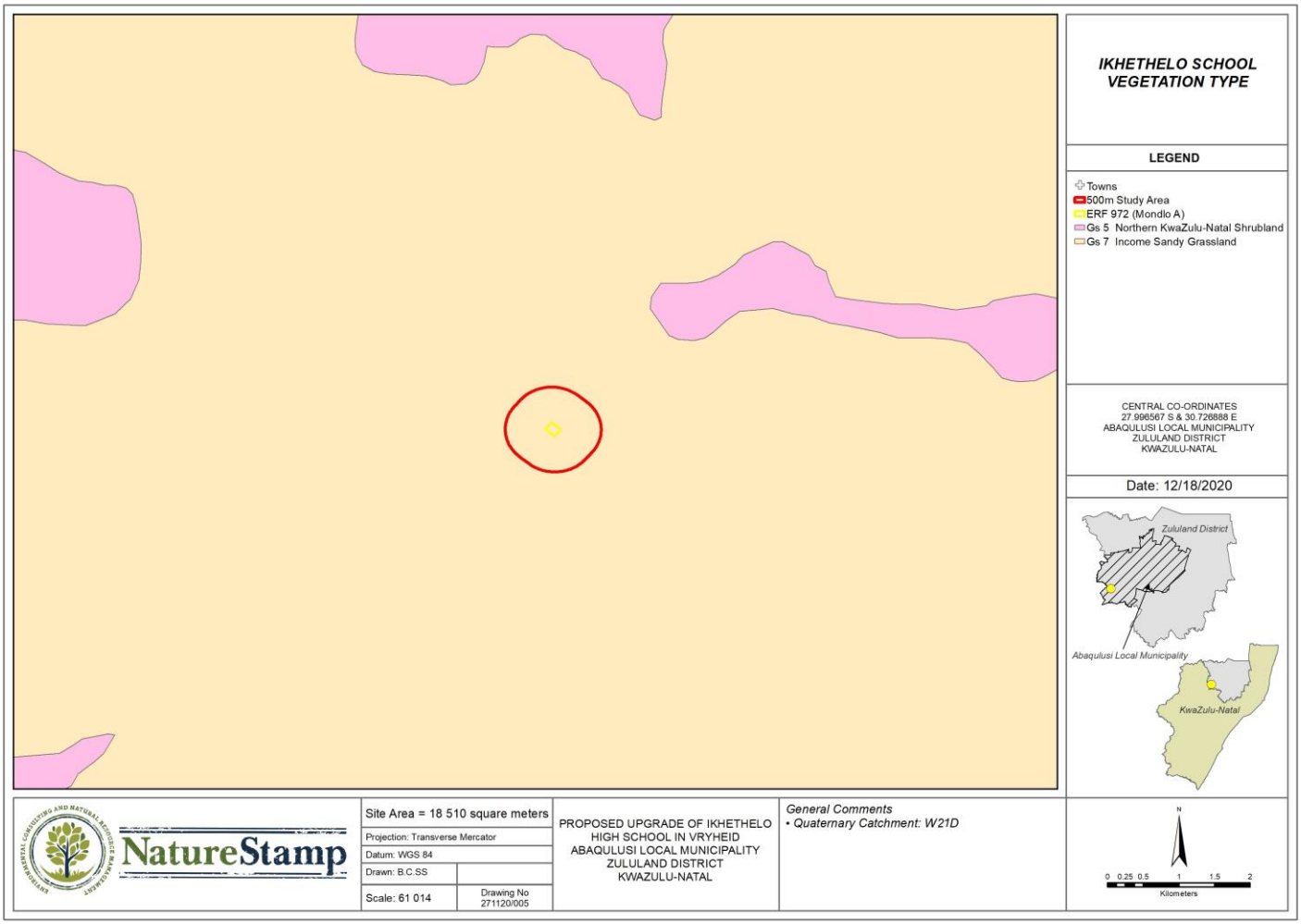

Figure 6 Vegetation type on the proposed development site

5.1.3 Bioresource Unit within the project

The Proposed Development is located in an area classified as BRU TUc1 – Sour Sandveld. The terrain type is mainly rolling, with an altitude range of 929 to 1 590 m, and slopes are generally moderate (5 to 12 %) and some are gentle (less than 5 %), with a very high risk of soil erosion. 11.8 % of the BRU is arable. 35.9 % of the arable land is high potential. Shallow soils occupy 37.9% of the BRU. Duplex soils are 26.3 % of the BRU. Soils of moderate to poor drainage occupy 78.6 % (Camp, 1998).

The vegetation primarily consists of alien plant species. The rainfall average is 630 mm per year. The mean temperature is 18.1 °C with the climate rating having limitations for crop growth. There is a risk of erosion.

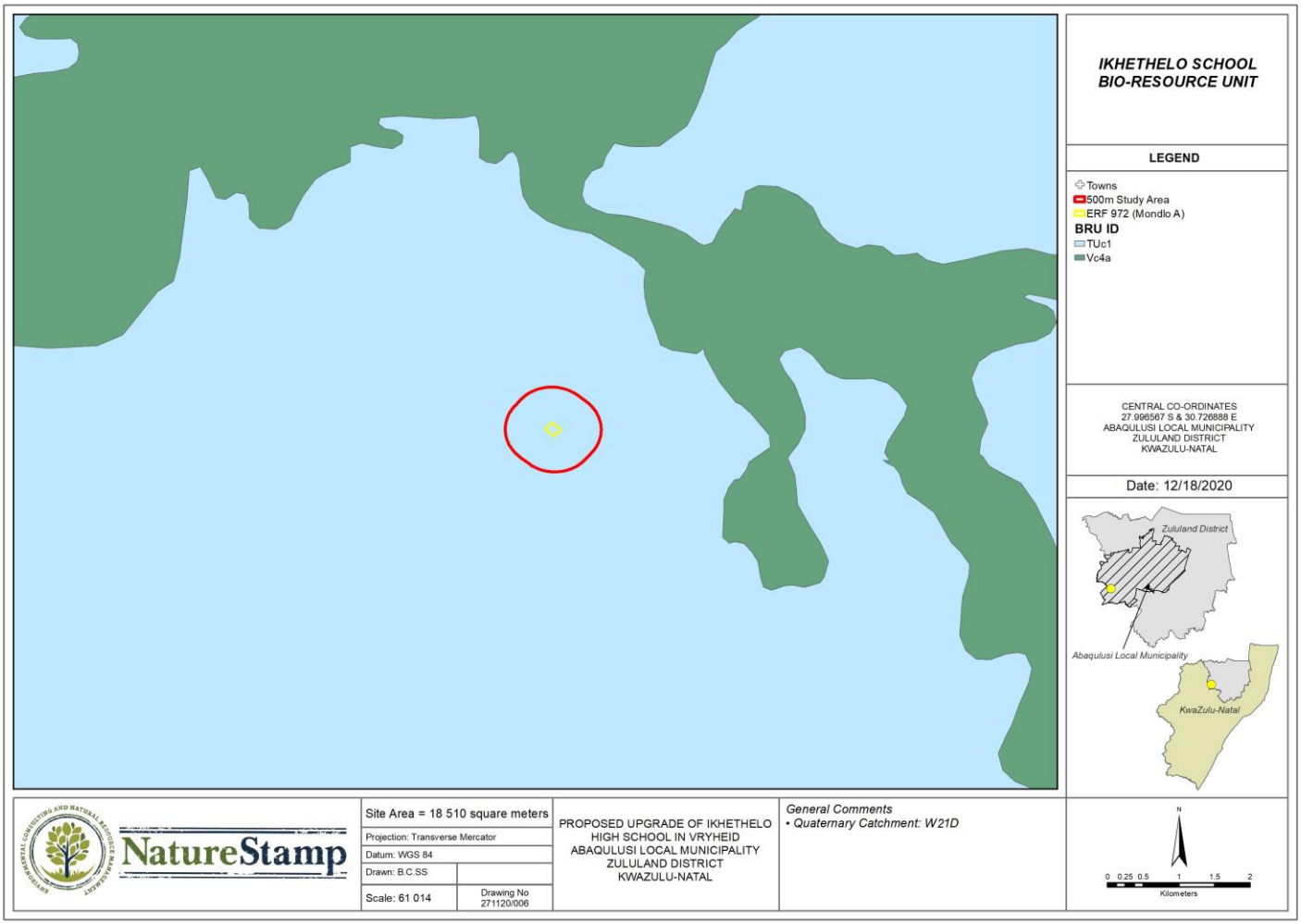

Figure 7 Bioresource units of the proposed development site.

5.1.4 Proximity to Protected Areas

The proposed site does not fall within 5 km a nature reserve, nor does it fall within 10km of a heritage site.

5.1.5 NFEPA Wetlands

There were no NFEPA wetlands identified on-site.

5.2 Vegetation On-site/ Vegetation Overview

The site is mapped as Income Sandy Grassland (Gs 7) which is considered vulnerable. However, there were very few indicators of this vegetation type remaining, and the historical aerial imagery available on (dating back to 1944) show that the site has been significantly modified for a long period. The main focus of the vegetation assessment was undertaken within and immediately surrounding the development footprint. A cursory walk through the area was conducted to gain a general overview of the integrity and vegetation assemblage present within the site boundary.

The periphery of the site is heavily invaded by alien plants such as *Lantana camara*, *Schinus terebinthifolius,* and *Melia azedarach* amongst others, with some litter, garden and building waste.

5.2.1 Invasive Alien Plants (IAPs)/Exotic Species

Ikhethelo school has historically been planted with ornamental trees, as was common during the period of its inception. The current vegetation cover consists predominantly of alien and pioneer tree species. The site is dominated by *Jacaranda mimosifolia, Lantana camara, Acacia melanoxylon* and *Melia azedarach.*

Subsequently a number of other alien invasive species have colonised both the boundary and the property overall.

Figure 8 Photos indicating some of the invasive alien tree species found at Ikhethelo school

5.2.2 Grassland & Forb Composition

Some small areas of grassland exist within the school. These areas are used as play areas and/or sports grounds. The forb and grassland species is typical for this area. *Ledoboria* and *Acalypha* are common forb species found throughout the site. Similarly, grass species such as *Melinis, Bromus* and *Eragrostis* were common throughout the site. It is likely that this grass is cut back every few months and there is no evidence of the grass areas being burnt.

Figure 9 Dominant forb species found on-site

Figure 10 Dominant grass species found on-site

5.2.3 Woody Tree Composition

Although the site consists of mostly alien tree species, some indigenous species were noted although these were isolated to individual trees. Trema orientalis (Pigeon Wood), Erythrina, Albizia and Dombeya were the key species identified on site. These species indicate that they would be the most suitable trees to plant for future management as they grow well under these conditions and are indigenous to the area. Some *Cussonia* species were found outside of the site and would be a good ornamental replacement for the school.

Figure 11 Some indigenous woody species found on-site

5.3 General Flora Overview

A full predicted species list can be found in Table 4. Additionally, the location of each key species has been provided in Figure 12. A number of category invasive species were identified. The key species which have shown signs of redistribution (seedlings noted on-site) are *Lantana camara* and *Melia azedarach*. These species should be removed or ringbarked on the site.

The Jacaranda tree, which is the most common species on –site does not currently pose a major threat but any small trees should be removed and future planting should only include indigenous species.

Table 4 List of species identified at Ikhethelo school

Species name	Common name	Growth form	Category
**Agave sisalana*	Sisal	Shrub/Tree	2
**Bidens pilosa L.*	Black jack	Herb	
**Bougainvillea glabra*	Paper flower	Shrub	
Pelargonium luridum	Variable stork's bill	Forb	
Paspalum urvillei	Vasey Grass	Grass	
Ledoboria apertiflora	Desert African hyacinth	Forb (red data)	
Acalypha punctata	Sticky Brooms and Brushes	Forb (red data)	
Melinis repens	Natal Red Top	Grass	
Paspalum notatum	Bahiagrass	Grass	
Bromus pectinatus	Hawergras	Grass (red data)	
Eragrostis curvula	Weeping love grass	Grass	
**Lantana camara L.*	Tick berry	Shrub	1b
**Melia azedarach*	Syringa	Tree	3
*Acacia longiflia	Long leaved wattle	Tree	1b
*Acacia melanoxylon	Australian Balckwood	Tree	2
Albizia versicolor	Large-leaved False-thorn	Tree	
*Casuarina equisetifolia	Horsetail tree	Tree	2
Chamaecyparis lawsoniana	Lawson cypress	Tree	
Dombeya rotundifolia	Wild pear	Tree	
Erythrina humeana	Coral Tree	Tree	
*Jacaranda mimosifolia	Jacaranda	Tree	1b (in kZN)
*Schinus molle	Peruvian pepper	Tree	
*Schinus terebinthifolius	Brazilian Pepper Tree	Tree	1b (in kZN)
Syagrus romanzoffiana	Queen palm	Tree	
Trema orientalis	Pigeon Wood	Tree	
Vachellia sieberiana	Paperbark thorn	Tree	

*denotes an alien species

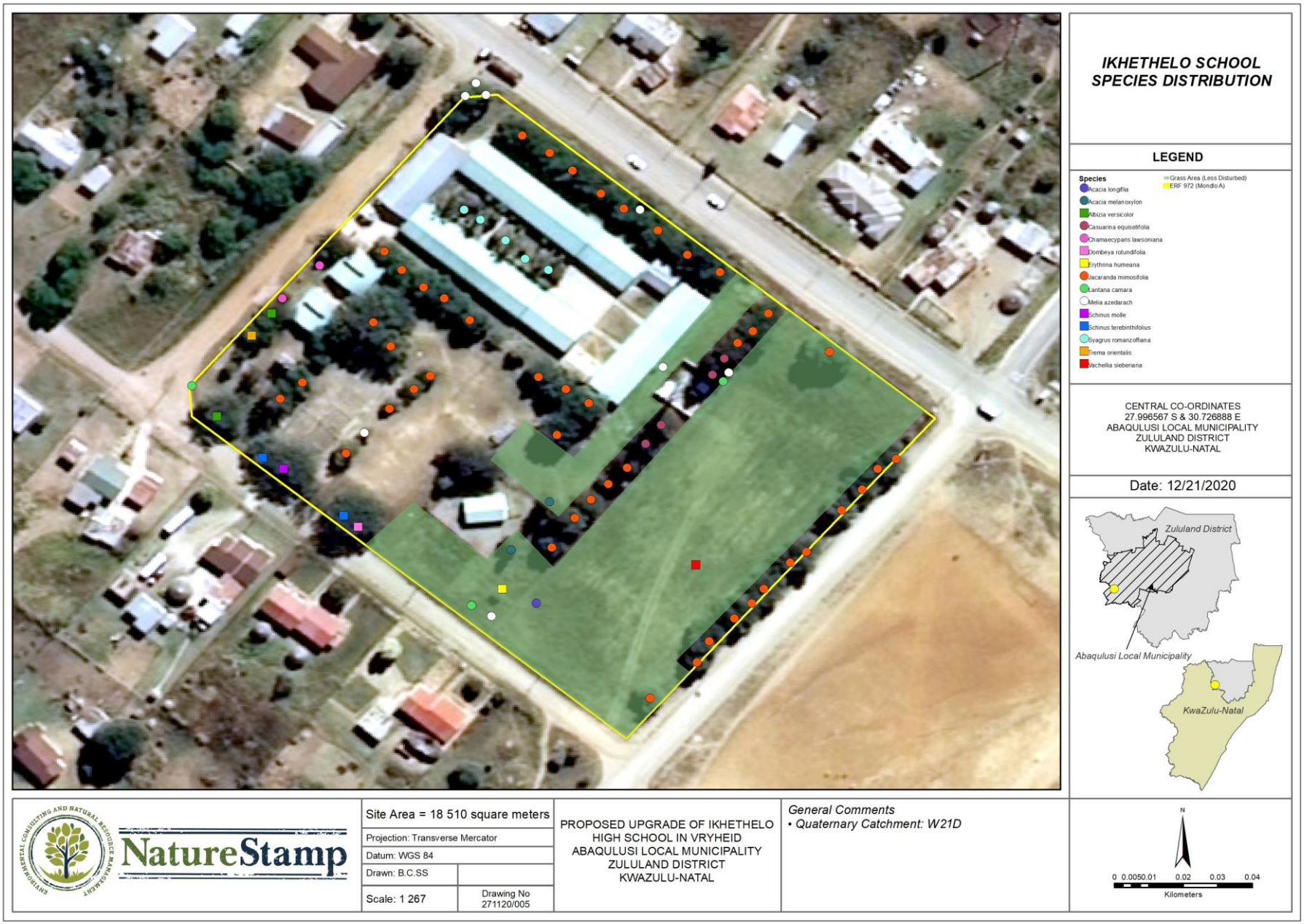

Figure 12 Species distribution as per the site assessment

5.4 Alien Plant Control Plan

Invasive and other noxious plants must be managed as per the requirements of the –

- Conservation of Agricultural Resources Act (Act 43 of 1983, as amended in March 2001) Regulations
- Notice No. R. 1048 of 25 May 1984, as amended by Government Notice No. R. 2687 of 6 December 1985) pertaining to weeds and invader plants control. As such, the following measures shall apply:
    - All growth forms of Category 1 weeds and invader plants shall actively be removed from all works areas, at all times; and
    - All Category 2 and 3 weeds and invader plants shall be actively removed all prior to flowering (See Appendix A for Alien Plant Removal and Control Methodology).
- The Department of Environmental Affairs (DEA) under the National Environmental Management: Biodiversity (NEMBA) Act 10 of 2004.

A set of Control guidelines for alien plant removal has been provided for the most common alien invasive species found on the site.

The proposed additions to the site are minor and occur over already existing structures/platforms. These control measures apply to any disturbed areas such as spoil site, concrete mixing or rubble areas. It is likely that the species on-site would spread back to disturbed areas should the alien plants be controlled. The below measures are a guide to shorten establishment time.

7.1.1 Re-establishment of Vegetation Assemblage

It is important to prepare the soil for vegetation rehabilitation. Once the soil has been prepared, appropriate seeds or rescued plants should be used for the rehabilitation process. This is only relevant if the new building breaks grassland or tree habitats.

There are several other methods / techniques available for employment in re-establishing the site. Through understanding the site, options have been identified as the correct methods to employ re-establishment. The planting methods are expanded upon below. Please note that re-vegetation planting must be undertaken in spring if possible to ensure that establishment is successful.

Table 5 Grass Species selected for the baseline Graminoid assemblage, proportions and position in the landscape

Grass species	Proportions	Kgs/hectare
Alloteropsis semialata	7.50%	2.25
Bothriochloa insculpta	10%	3
Brachiaria serrata	5%	1.5
Eragrostis capensis	10.00%	3
Melinis repens	12.50%	4.5
Melinis nerviglumis	10.00%	3
Paspalum notatum	10%	3
Monocymbium ceresiiforme	7.50%	2.25
Bromus pectinatus	5%	1.5
Sporobolus pyramidalis	10%	3
Themeda triandra	20.00%	6
Tristachya leucothrix	5%	1.5
Total	**100%**	**30**

If the above seed mix stated is not available, the following species may be included, as they are commercially available. However, this should be avoided if possible as *Eragrotis tef* and *Chloris gayana* are alien species but have been included due to their ease of establishment and soil stabilising attributes.

- *Eragrostis tef* 3kg/ha
- *Digitaria eriantha* 6kg/ha
- *Panicum maximum* 4 kg/ha

- *Chloris gayana* 6kg/ha
- *Cynodon dactylon* 6kg/ha

In order to properly implement the re-vegetation component, the following general planting guidelines have been adopted to drive the rehabilitation process.

- Non-woody portions must be returned to graminoid assemblages which favour relevant specific habitats.
- Wherever alien woody vegetation is removed, indigenous trees can be planted back at a density equal to that of the surrounding indigenous areas.
- Removal of existing alien species must be consistently undertaken.
- Rehabilitation of disturbed areas after the construction of the proposed expansion must be done as soon as possible after construction is completed.
- If it is necessary to import soil onto the site, the material; must be checked to ensure that it is not contaminated by weeds or invasive plants.

7.1.2 Hydraulic Seeding/Hydro Seeding

This method of seeding is quick and effective especially on steep, critical slopes and inaccessible areas that cannot practically be seeded by other methods. Hydro-seeding includes seed, water, fertilizer and a small amount of mulch in a slurry transported in a tank, either truck or trailer mounted and sprayed over prepared ground in a uniform layer.

Although hydraulic planting is more expensive than manual seeding and mulching, it has many benefits. With hydraulic planting, the seed blend can be distributed uniformly, the added mass increases accuracy and throw distance, especially in exposed, windy areas, while pre-soaking and water accelerates germination and enhances the chance of survival.

7.1.3 Use of Plugs

Plugs should be applied where immediate cover is required for stabilisation. Particular areas would be drainage channels and very steep banks. Plugs should be –

- Planted at 10 cm centres
- Over a pegged artificial mesh (e.g. a light polypropylene, UV stabilised mesh with about 20mm openings) in areas of very high water velocity;
- Watered immediately to enhance establishment;
- Watered regularly for the first seven days or as required to effect establishment.

In areas where steep slopes require stabilisation a requirement may arise for the soils to be stabilised through the use of Geotextiles. Ideally, vegetation is the best form of erosion control, with Geotextiles only used for temporary stabilization purposes until this can establish. In coastal areas, Geotextiles are only superior to hydro-mulching in the following situations:

- When the growing season is short or unfavourable and plants cannot stabilize a slope quickly;
- When surfaces are so unstable or contours so channelled that a heavy rain could result in significant and costly erosion damage.

6. CONCLUSION

The site is in a poor ecological state. The development footprint is an existing school road with the proposed areas for upgrade being existing structures. There were also signs of illegal waste and building rubble on-site.

Having undertaken the assessment of the proposed development footprint the following findings were noted.

- The site is considered transformed (CBA);
- The development footprint is already transformed and degraded;
- The site is not within 5km of a nature reserve;
- The site on the whole is degraded and overgrown with both alien and indigenous pioneer species although there are a few protected species within the grassland and in the understory;
- Infestations of alien plants are present along road verges and within the property across the study boundary;

Although the risk of the proposed upgrade is low, guidelines as per this report should still be adopted. Any future planting should adopt indigenous species.

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ANNEXURE A REGULATIONS AND LEGISLATION

The following protocol is extracted from the National Environmental Management Act, Act 108 of 1998 (NEMA) as amended in 2014. The relevant Section is included below:

Specialist reports and reports on specialised processes

(1) An applicant or the EAP managing an application may appoint a person who is independent to carry out a specialist study or specialised process.

(2) The Person referred to in sub-regulation (1) must comply with the requirements of Regulation 17.

(3) A specialist report or a report on a specialised process prepared in terms of these Regulations must contain –

(a) details of –

(i) the person who prepared the report; and

(ii) the expertise of that person to carry out the specialist study or specialised process;

(b) a declaration that the person is independent in a form as may be specified by the competent authority;

(c) an indication of the scope of, and the purpose for which, the report was prepared;

(d) a description of the methodology adopted in preparing the report or carrying out the specialised process;

(e) a description of any assumptions made and any uncertainties or gaps in knowledge;

(f) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment;

(g) recommendations in respect of any mitigation measures that should be considered by the applicant and the competent authority;

(h) a description of any consultation process that was undertaken during the course of carrying out the study;

(i) a summary and copies of any comments that were received during any consultation process; and

(j) any other information requested by the competent authority.

In addition there are various Sections of the legislation that would be applicable to the proposed development and / or the land as it currently is.

- **NATIONAL ENVIRONMENTAL MANAGEMENT ACT, ACT NO. 107 OF 1998 (NEMA)**

NEMA requires, *inter alia*, that:

"Development must be socially, environmentally, and economically sustainable",

"Disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied."

"A risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions",

NEMA also states that;

"The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage."

- **NATIONAL FORESTS ACT (ACT NO. 84 OF 1998)**

According to this act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that;

"No person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister."

Any disturbance, removal, pruning or transplanting of these species would require a licence from the administrators of the National Forests Act, who are an extension of the Department of Agriculture, Forestry and Fisheries (DAFF) based in Pietermaritzburg.

- Permit */ Licence requirements*

In terms of the National Forests Act, 1998 (Act No. 84 of 1998) and Government Notice 1339 of 6 August 1976 (promulgated under the Forest Act, 1984 (Act No. 122 of 1984) for protected tree species), the removal, relocation or pruning of any protected plants will require a license.

Protected indigenous plants in general are controlled under the relevant provincial Ordinances or Acts dealing with nature conservation. In KZN the relevant statute is the 1974 Provincial Nature Conservation Ordinance. In terms of this Ordinance, a permit must be obtained from *Ezemvelo KZN* Wildlife to remove or destroy any plants listed in the Ordinance. However, the list for Specially Protected Species in KwaZulu-Natal was (1974) has become very difficult to interpret and to apply to the plant species recorded during vegetation surveys. This is because of major taxonomic changes in the petalloid monocots. It must be noted that this list is in urgent need of an update. Therefore subjective decisions regarding a species protection status have to be taken which may not always be in agreement with the 1974 Ordinance.

- **NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT (ACT NO. 10 OF 2004)**

In terms of the Biodiversity Act, the developer has a responsibility for:

- The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations).

- Promote the application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all development within the area are in line with ecological sustainable development and protection of biodiversity.

- Limit further loss of biodiversity and conserve endangered ecosystems.

- **CONSERVATION OF AGRICULTURAL RESOURCES (ACT NO. 43 OF 1983) AS AMENDED IN 2001**

Declared Weeds and Invaders in South Africa are categorised according to one of the following categories:

Category 1 *plants: are prohibited and must be controlled.*

Category 2 *plants: (commercially used plants) may be grown in demarcated areas providing that there is a permit and that steps are taken to prevent their spread.*

Category 3 *plants: (ornamentally used plants) may no longer be planted; existing plants may remain, as long as all reasonable steps are taken to prevent the spreading thereof, except within the flood line of watercourses and wetlands.*

ANNEXURE B METHODOLOGIES

- **EZEMVELO KZN WILDLIFE C-PLAN & SEA DATABASE**

The C-Plan is a systematic conservation-planning package that runs with the GIS software ArcGIS, and which analyses biodiversity features and landscape units. C-Plan is used to identify a national reserve system that will satisfy specified conservation targets for biodiversity features (***Ezemvelo* KZN Wildlife, 2010**). Biodiversity features can be land classes or species, and targets are set within area units either for land classes, or as numbers of occurrences of species for species locality data sets (***Ezemvelo* KZN Wildlife, 2010**). These units or measurements are used as surrogates for un-sampled data. The C-Plan is an effective conservation tool when determining priority areas at a regional level and is being used in South Africa to identify areas of high conservation value. The SEA (**Goodman, 2004**) modelled the distribution of a selection of 255 red data and endemic species that have the potential to occur in the area.

- *Irreplaceability Analysis*

The following is referenced from **Goodman (2004)**:

The first product of the conservation planning analysis in C-Plan is irreplaceability map of the planning area, in this case the province of KwaZulu-Natal. This map is divided into grid cells called 'Planning Units'.

Each planning unit has associated with it an 'Irreplaceability Value', which is a reflection of the planning units' importance with respect to the conservation of biodiversity. Irreplaceability reflects the planning unit's ability to meet set 'targets' for selected biodiversity 'features'. The irreplaceability value is scaled between 0 and 1.

Irreplaceability value – 0. Where a planning unit has an irreplaceability value of 0, all biodiversity features recorded here are conserved to the target amount, and there is unlikely to be a biodiversity concern with the development of the site.

Irreplaceability value – 1. These planning units are referred to as totally irreplaceable and the conservation of the features within them is critical to meet conservation targets. (EIA very definitely required and depending on the nature of the proposal unlikely to be granted).

Irreplaceability value > 0 but < 1. Some of these planning units are still required to meet biodiversity conservation targets. If the value is high (e.g. 0.9) then most units are required (few options available for alternative choices). If the value is low, then many options are available for meeting the biodiversity targets. (EIA required and depending on the nature of the proposed development, permission could be granted)."

The irreplaceability units have been optimised further to create various subcategories called *Critical Biodiversity Areas* and *Ecological Support Areas* (***Ezemvelo* KZN Wildlife, 2014).**

- *Critical Biodiversity Areas*

Critical Biodiversity Areas (CBAs) can be divided into two subcategories, namely *Irreplaceable* and *Optimal*. Each of these can in turn be subdivided into additional subcategories (**Table 1**). The CBA categories are based on the optimised outputs derived using systematic conservation planning software, with the Planning Units (PU) identified representing the localities for which the conservation targets for one or more of the biodiversity features contained within can be achieved. The distribution of the biodiversity features is not always applicable to the entire extent of the PU, but is more often than not confined to a specific niche habitat e.g. a forest or wetland reflected as a portion of the PU in question. In such cases, development could be considered within the PU if special mitigation measures are put in place to safeguard this feature(s) and if the nature of the development is commensurate with the conservation objectives. Obviously this is dependent on a site by site, case by case basis.

Using C-Plan, areas are identified through the MINSET analysis process and reflect the negotiable sites with an Irreplaceability score of less than 0.8. Within the C-Plan MINSET analysis this does not mean they are of a lower biodiversity value. It simply means more options are available for the safeguarding of sensitive or important features over and above the required conservation targets (e.g. 30% of a certain vegetation type remains and the conservation target is 25%). The determination of the spatial locality of these PU's is driven primarily by the Decision Support Layers.

Table 6 Summary of CBA Categories (from *Ezemvelo* KZN Wildlife, Biodiversity Spatial Planning Terms).

Category	C-Plan	MARXAN	Expert Input/ Desktop	Biodiversity Sector and Regional Plans
CBA: Irreplaceable (SCA)	Irreplaceability = 1	No equivalent		CBA: Irreplaceable
CBA: High Irreplaceable(SCA)	Irreplaceability Score >= 0.8 and <1.0	Selection frequency value = 80% –100%		CBA: Irreplaceable
CBA: Irreplaceable Expert Input			Expert input	CBA: Irreplaceable
CBA: Irreplaceable Linkage			Desktop and expert input	CBA: Irreplaceable
CBA: Optimal (SCA)	Irreplaceability Score > 0 and < 0.8	"Best" solution from MARXAN runs less the identified CBA High Irreplaceability areas		CBA: Optimal
CBA: Optimal, High Degradation	Irreplaceability Score > 0 and < 0.8	"Best" solution from MARXAN runs less the identified CBA High Irreplaceability areas	Field Assessment	CBA: Optimal
CBA: Optimal Low Degradation	Irreplaceability Score > 0 and < 0.8	"Best" solution from MARXAN runs less the identified CBA High Irreplaceability areas	Field Assessment	CBA: Optimal
CBA: Optimal Expert Input			Expert input	CBA: Optimal

- *Ecological Support Areas*

Ecological Support Areas (ESAs) are required to support and sustain the ecological functioning of Critical Biodiversity Areas (CBAs). For terrestrial and aquatic environments, these areas are functional but are not necessarily pristine natural areas. They are required to ensure the persistence and maintenance of biodiversity patterns and ecological processes within the CBAs, and contribute significantly to the maintenance of Ecological Infrastructure[1] (EI).

[1] **A term referring to areas in the landscape which provide significant Ecosystem Services which contribute positively to the economy and human welfare. Examples include 'Flood mitigation' and 'Good Water Quality' (provided both by wetlands and well maintained water catchments). Ecological infrastructure is the stock of functioning ecosystems that provides a flow of essential system services to human communities – services such as the provision of fresh water, climate regulation and soil formation. Ecological infrastructure includes features such as healthy mountain catchments, rivers, wetlands, and nodes and corridors of natural grassland habitat which together form a network of interconnected structural elements within the**

- *Landscape Corridors*

A series of bio-geographic corridors were created in KZN to facilitate evolutionary, ecological and climate change processes to create a linked landscape for the conservation of species in a fragmented landscape.

- *Local Corridors*

Corridors were developed at a district scale to create fine scale links within the landscape that facilitate ecological processes and ensure persistence of critical biodiversity features.

• BIO RESOURCE UNITS (BRU)

A Bioresource Unit is a demarcated area in which the environmental conditions such as soil, vegetation, climate and, to a lesser degree, terrain form, are sufficiently similar to permit uniform recommendations of land use and farm practices to be made, to assess the magnitude of crop yields that can be achieved, to provide a framework in which an adaptive research programme can be carried out, and to enable land users to make correct decisions **(Camp, K.G.T. 1998)**.

The environmental factors defined in a BRU should give an indication of habitat suitability for both plant and animal species. On the other hand, knowing the habitat requirements of any particular species, it should be possible to map locations suitable for such species. There are 590 BRUs in KwaZulu-Natal.

• ENVIRONMENTAL POTENTIAL ATLAS

The following is referenced from the Department of Environmental Affairs and Tourism (2007): The Environmental Potential Atlas (ENPAT) developed from a single map of Gauteng to a complete spatial data set of the entire South Africa.

ENPAT was updated in July 2001 and is used by the National Department of Environmental Affairs and Tourism and various provincial environmental management departments as a decision-making tool in the process of environmental impact assessments. ENPAT includes the decision-making parameters such as: high-risk development category indications and potential impacts are linked to the 1:250 000 spatial databases on national and provincial level.

The main purpose of ENPAT is to proactively indicate potential conflicts between development proposals and critical or sensitive environments. ENPAT can also be used for development planning since it indicates the environment's potential for development.

landscape. If this ecological infrastructure is degraded or lost, the flow of ecosystem services will diminish and ecosystems will become vulnerable to shocks and disturbances, such as the impacts of climate change, unsustainable land use change and natural disasters like floods and droughts. It is important to note that when ecological infrastructure is degraded or fails, the direct monetary cost to society and government is often very high. Ecological infrastructure is, therefore, the nature-based equivalent of hard infrastructure, and is just as important for providing the vital services that underpin social development and economic activity.

ENPAT consists of two distinct, parallel sets of information: natural or environmental characteristics, and social-economic factors. The environmental character maps depict geology, land types, soils, vegetation, and hydrology. The socio-economic factors consist of land cover, cadastral aspects and infrastructure, land use and culture.

These two sets of information are combined and assessed in terms of their potential or latent environmental sensitivity. Sensitivity is assigned based on the ability of a resource to absorb change or impact. A value of **0** indicates a **low sensitivity** - thus a high ability to accept change and a value of **1** indicates a **high sensitivity**, or a low ability to accept change. Areas of low sensitivity are thus available or suitable for development.

- **MUCINA AND RUTHERFORD'S VEGETATION ASSESSMENT AND KWAZULU – NATAL VEGETATION TYPES (KZN VT)**

Mucina and Rutherford present an up-to-date and comprehensive overview of the vegetation of South Africa and the two small neighbouring countries of Lesotho and Swaziland. This account is based on vegetation survey using appropriate tools of contemporary vegetation mapping and vegetation description. They aimed at drawing a new vegetation map that depicts the complexity and macro-scale ecology and reflects the level of knowledge of the vegetation of the region. This is an extensive account of the vegetation of a complex and biologically intriguing part of the world, offering not only insights into structure and dynamics of the vegetation cover, but containing a wealth of base-line data for further vegetation-ecological, biogeographical, and conservation-oriented studies. The map and the descriptive account of the vegetation of South Africa, Lesotho and Swaziland offers a powerful decision-making tool for conservationists, land and resource planners, and politicians as well as the interested public at large. KwaZulu-Natal (KZN) province is rich in natural diversity. The KZN VT was created to provide an accurate representation of the historical extent of the vegetation types present in KZN with the most current available information. A key issue of concern is our current lack of knowledge regarding the historical extents of both our wetland and forest biomes. Almost all vegetation mapping conducted currently only displays the current extent of the feature in question. As such, no true understanding as to rates of loss and or minimum required habitat areas required to ensure persistence can be accurately determined. This issue further influences our understanding of the grassland/savannah/bushland matrix within which these features reside. The KZN VT map has undergone several changes since the publication of the Mucina and Rutherford (2006) national vegetation types.

Ezemvelo KZN Wildlife has, in association with various government departments, NGOs, Working Groups and Forums, municipalities and parastatals, refined the KZN VT to develop an accurate representation of the extent of the vegetation types present. As a result of the finer scale mapping and classification, KZN VT map has in some cases identified new vegetation types and or subtypes within the vegetation types identified at national level. These changes have been peer reviewed and adopted by the National Vegetation Committee, and have been incorporated into the revised South African Vegetation map.

- **NATIONAL FRESHWATER ECOSYSTEM PRIORITY AREAS (NFEPA)**

NFEPA was a three-year partnership project between South African National Biodiversity Institute (SANBI), CSIR, Water Research Commission (WRC), Department of Environmental Affairs (DEA), Department of Water Affairs (DWA),

Worldwide Fund for Nature (WWF), South African Institute of Aquatic Biodiversity (SAIAB) and South African National Parks (SANParks) **(Van Deventer *et al.* 2010)**. NFEPA map products provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources. These strategic spatial priorities are known as Freshwater Ecosystem Priority Areas, or FEPAs.

FEPA maps and supporting information form part of a comprehensive approach to sustainable and equitable development of South Africa's scarce water resources. They provide a single, nationally consistent information source for incorporating freshwater ecosystem and biodiversity goals into 2 planning and decision-making processes. For integrated water resource management, the maps provide guidance on how many rivers, wetlands and estuaries, and which ones, should remain in a natural or near-natural condition to support the water resource protection goals of the National Water Act (Act No. 36 of 1998; RSA, 1998a). FEPA maps are therefore directly applicable to the National Water Act, feeding into Catchment Management Strategies, classification of water resources, reserve determination, and the setting and monitoring of resource quality objectives. FEPA maps are also directly relevant to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004; RSA, 2004) (hereafter referred to as the Biodiversity Act), informing both the listing of threatened freshwater ecosystems and the process of bioregional planning provided for by this Act. FEPA maps support the implementation of the National Environmental Management: Protected Areas Act (Act No. 57 of 2003; RSA, 2003) (hereafter referred to as the Protected Areas Act) by informing the expansion of the protected area network. They also inform a variety of other policies and legislation that affect the management and conservation of freshwater ecosystems, including at the municipal level.

FEPAs are strategic spatial priorities for conserving freshwater ecosystems and supporting sustainable use of water resources. FEPAs were determined through a process of systematic biodiversity planning and were identified using a range of criteria for conserving ecosystems and associated biodiversity of rivers, wetlands and estuaries.

FEPAs are often tributaries and wetlands that support hard-working large rivers, and are an essential part of an equitable and sustainable water resource strategy. FEPAs need to stay in a good condition to manage and conserve freshwater ecosystems, and to protect water resources for human use. This does not mean that FEPAs need to be fenced off from human use, but rather that they should be supported by good planning, decision-making and management to ensure that human use does not impact on the condition of the ecosystem. The current and recommended condition for all river FEPAs is A or B ecological category. Wetland FEPAs that are currently in a condition lower than A or B should be rehabilitated to the best attainable ecological condition.