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Dear Welcome

REPORT ON VEGETATION IN PROXIMITY TO THE PROPOSED UMHLATUZE WEIR UPGRADE

1. Introduction

According to the background information document provided, a weir was constructed on the uMhlatuze River in 1983 as part of the water provision system for Richards Bay and Hillendale Mine areas with the purpose of maintaining an abstraction head for the pumping station on the west bank of the river. The existing weir has been compromised through the years by a number of factors including the 1987 floods and its condition has continued to deteriorate to the extent that it is currently being unstable, affecting how efficiently it serves its purpose. Umhlathuze Water proposes constructing a new weir to improve the efficiency of the structure and thereby improve water provision to the affected areas. Construction of this new weir is now considered essential as the demand for water in these areas has increased.

David Styles Vegetation Surveys, Advice & Consulting has been contracted to investigate the possible effects on the vegetation in proximity to the proposed uMhlatuze River Weir upgrade. The study site and detailed plan are shown in Appendix 1.

2. Methodology

The site was surveyed on a walkthrough basis on 7 October 2016, with banks above and below the weir visited, together with terrestrial areas accessible by foot within the channel. During the survey, photographs, GPS points and notes were taken of features of interest and a species list compiled.

3. Land Use

The area surrounding the proposed development is 100% transformed by commercial agriculture in the form of sugar cane farming. The existing weir and pump station have been in existence since 1983 and have had a notable impact on the ecological functioning of the river and on the vegetation of the affected river reach (Appendix 3).

4. High level data sources

4.1 Vegetation types – national and provincial vegetation mapping

According to both the National Vegetation Map (Mucina and Rutherford 2006) and the provincial vegetation map developed by Ezemvelo KZN Wildlife (Scott-Shaw and Escott 2011) the area around the proposed development is predominantly Subtropical Freshwater Wetlands together with a small area mapped as Maputaland Coastal Belt (as shown in Appendix 4.1). The on-the-ground assessment found that due to land use practices around the proposed development, the site is highly transformed, and particularly beyond the banks the vegetation is dominated largely by alien and invasive species, with a considerable number of these also in the aquatic habitat.

In natural condition, one might find the following (according to Mucina and Rutherford 2006):

4.1.1 Subtropical Freshwater Wetlands (AZf 6)

The vegetation type often consists of wetlands embedded within the Coastal Belt from Transkei as far as Maputaland at an altitude ranging from 0 –1400m. Vegetation and landscape features typically include flat topography supporting low beds dominated by reeds, sedges and rushes, waterlogged meadows dominated by grasses. Found typically along edges of often seasonal pools in aeolian depressions as well as fringing alluvial backwater pans or artificial dams.

Waterlogged, clayey soils of Champagne and Arcadia forms, containing certain levels of decaying organic matter are often encountered, especially in very productive reed beds. These wetlands are underlain mostly by Cenozoic alluvium, less so by Karoo Supergroup volcanic rocks and sediments, as well as by the Cretaceous (and younger coastal) sediments of the Zululand and Maputaland Groups.

Important Taxa
Marshes
Small Trees: *Hyphaene coriacea*, *Phoenix reclinata*.
Graminoids: *Chloris virgata*, *Cynodon dactylon*, *Cyperus articulatus*, *Dactyloctenium aegyptium*, *Diplachne fusca*, *Echinochloa pyramidalis*, *Fimbristylis obtusifolia*, *Hemarthria altissima*, *Imperata cylindrica*, *Ischaemum arcuatum, Leersia hexandra*, *Pycreus mundii*, *Sporobolus nitens*, *S. smutsii*, *Urochloa stolonifera*, *Bolboschoenus glaucus, Courtoisia cyperoides*, *Cyperus alopecuroides*, *C. pectinatus*, *Digitaria natalensis*, *Echinochloa stagnina*, *Eragrostis chapelieri, E. lappula, Eriochloa meyeriana*, *Fimbristylis bisumbellata*, *Fuirena ecklonii*, *Oxycaryum cubense*, *Paspalidium obtusifolium*, *Paspalum commersonii*, *Pycreus pelophilus*, *P. polystachyos*, *Scleria poiformis*, *Sporobolus consimilis*.
Herbs: *Pentodon pentandrus, Persicaria senegalensis*, *Burmannia madagascariensis, Centella coriacea*, *Commelina diffusa, Convolvulus mauritanicus*, *Desmodium dregeanum*, *Eclipta prostrata, Epaltes gariepina*, *Eriocaulon abyssinicum*, *Ethulia conyzoides*, *Glinus lotoides*, *Hydrocotyle ranunculoides, Ludwigia adscendens* subsp. *diffusa*, *L. leptocarpa*, *L. octovalvis*, *L. palustris*, *Neptunia oleracea*, *Persicaria attenuata* subsp. *africana, P. hystricula*, *Rorippa madagascariensis*, *Sium repandum*, *Vahlia capensis*.
Geophytic Herbs: *Eulophia angolensis*, *Zeuxine africana*.
Succulent Herb: *Salicornia pachystachya*.
Semiparasitic Herb: *Buchnera longespicata*.

Aquatic Herbs: *Bergia salaria*, *Lagarosiphon crispus*.

Reed & sedge beds
Megagraminoids: *Cladium mariscus* subsp. *jamaicense*, *Cyperus papyrus*, *Phragmites australis*, *P. mauritianus*, *Schoenoplectus corymbosus*, *S. scirpoideus*, *Typha capensis*.
Graminoids: *Cyperus fastigiatus*, *C. difformis*, *C. digitatus, C. latifolius*, *C. sexangularis*, *Fuirena ciliaris*.

Very few of these were found in proximity to the proposed development.

Biogeographically Important Taxa (all southernmost distribution limit)
Streambanks
Herbs: *Floscopa glomerata, Ipomoea aquatica.*
Geophytic Herb: *Bolbitis heudelotii*.

Reed & sedge beds
Graminoids: *Cyperus dives, C. procerus, C. prolifer.*

Endemic Taxa
Marshes
Graminoid: *Cyperus sensilis* (embedded within Indian Ocean Coastal Belt of KwaZulu-Natal).

Very few of these were found in proximity to the proposed development (see on-site observations below).

Conservation: This vegetation is Least Threatened. So far only about 4% has been transformed (largely for cultivation), but the pressure of local grazing and urban sprawl will result in the demise of many subtropical freshwater habitats. Disturbance leads to invasion by alien plants such as *Lantana camara*, *Chromolaena discolor* and *Melia azedarach* (on the edges of wetlands) and aquatic weeds such as *Eichhornia crassipes*, *Pistia stratiotes* and *Salvinia molesta* (in water bodies).

4.1.2 Maputaland Coastal Belt (CB 1)

The vegetation type is distributed in KwaZulu-Natal Province (and continuing also in southern Mozambique) in a broad strip up to 35km along the coast of the Indian Ocean stretching from the Mozambique border in the north to Mtunzini in the south. Altitude varies from about 20 – 120m.

Vegetation and landscape features consist of a flat coastal plain originally probably densely forested in places with a wide range of interspersed non-forest plant communities including dry grasslands (which include palm veld where special conditions prevail), hygrophilous grasslands and thicket groups. Today the vegetation landscape is composed of pockets of various forest types (separated into different vegetation units), thickets, primary and secondary grasslands, extensive timber plantations and cane fields. The belt of the IOCB immediately inland (only a few kilometres wide) and parallel to the line of Northern Coastal Forest has a characteristic appearance of very irregular dunes with generally open vegetation and *Syzygium cordatum* dotted prominently on the dunes, with many irregular dune slacks interspersed. Maputaland Wooded Grassland (CB 2) is embedded within the geographical extent of the Maputaland Coastal Belt, but is treated as a separate vegetation unit.

Soils consist of more recent Quaternary sediments of marine origin—mainly yellowish and argillaceous redistributed sands (Berea and Muzi Formations of the Maputaland Group, respectively) and are nutritionally very poor and well leached, except in the inter-dune depressions where organic-rich soils are sometimes found.

Important Taxa
Low Shrubs: *Agathisanthemum bojeri* , *Helichrysum kraussii, Tephrosia longipes*.
Small Trees & Tall Shrubs: *Syzygium cordatum*, *Acacia natalitia*, *Annona senegalensis*, *Apodytes dimidiata*, *Bridelia cathartica*, *Canthium inerme*, *Chrysanthemoides monilifera* subsp. *rotundata*, *Euclea natalensis* subsp. *natalensis*, *Ficus burtt-davyi*, *Kraussia floribunda*, *Phoenix reclinata*, *Searsia* (*Rhus*) *natalensis*, *Sclerocroton integerrimum*, *Strychnos spinosa*.
Woody Climbers: *Abrus precatorius* subsp. *africanus*, *Smilax anceps*.
Herbs: *Achyranthes aspera*, *Centella asiatica*, *Chamaecrista plumosa*, *Hermbstaedtia odorata* var. *aurantiaca*, *Vernonia centaureoides*, *V. oligocephala*.
Graminoids: *Diheteropogon amplectens*, *Eragrostis sclerantha*), *Ischaemum fasciculatum*, *Themeda triandra*, *Urelytrum agropyroides*, *Aristida stipitata* subsp. *graciliflora*, *Cymbopogon pospischilii*, *Elionurus muticus*, *Eragrostis inamoena*, *E. lappula*, *Sporobolus subulatus*, *Trachypogon spicatus*, *Trichoneura grandiglumis*, *Tristachya leucothrix*.

Biogeographically Important Taxa
Geoxylic Suffrutex: *Diospyros galpinii*.
Low Shrubs: *Indigofera williamsonii*, *Searsia* (*Rhus*) *kwazuluana*, *Stylosanthes fruticosa*.
Small Trees & Tall Shrubs: *Hyphaene coriacea*, *Ozoroa obovata*, *Searsia* (*Rhus*) *nebulosa*, *Synaptolepis kirkii*.
Woody Climber: *Dalbergia obovata*.
Herbs: *Helichrysopsis septentrionale*, *Helichrysum tongense*, *H. cymosum* subsp. *cymosum*, *Nidorella tongensis*, *Senecio ngoyanus*, *Vernonia natalensis*. Megaherb: *Strelitzia nicolai*.
Succulent Herb: *Orbea longidens*.
Semiparasitic Herb: *Striga junodii*.
Graminoid: *Monocymbium ceresiiforme*.

Endemic Taxa
Herbs: *Helichrysum adenocarpum* subsp. *ammophilum*, *Vahlia capensis* subsp. *vulgaris* var. *longifolia*.
Geophytic Herbs: *Asclepias gordon-grayae*, *Kniphofia leucocephala*, *Raphionacme lucens*.
Graminoid: *Restio zuluensis.*

Conservation: Vulnerable. More than 30% transformed for plantations and cultivation and by urban sprawl. Aliens include scattered populations of *Chromolaena odorata* and *Lantana camara*. Erosion is mostly very low. This vegetation type has a relatively high number of plant taxa at the southernmost and northernmost limits of their distribution range—the occurrence of widely disjunct or outlier populations increases the conservation value of this vegetation type.

Most of the Maputaland Coastal Belt is agricultural land and very little of this unit remains in a natural state in the South African part of Maputaland. A much larger area of well-preserved coastal belt is found in Mozambique.

None of this vegetation type occurs in natural or near-natural condition in proximity to the proposed development.

4.2 Ezemvelo KwaZulu-Natal Wildlife's Systematic Conservation Plan (C-Plan)

The study site is shown as a lower order "Biodiversity Area" for the terrestrial C-Plan (Appendix 4.1). This is a designation given to areas that are not mandatory in terms of meeting provincial biodiversity conservation targets. The presence of Maputaland Coastal Grassland is noted, as are the presence of the millipede *Orthoporoides corrugatus* and the orthopteran *Parepistaurus eburlineatus*.

There are no Freshwater C-Plan impacts and the area is designated as "Available" (Appendix 5.2).

5. Observations on site

The disturbance caused during the construction and ongoing operation and maintenance of the uMhlatuze weir, together with intensive sugar cane cultivation around has created vegetation that contains limited species diversity, absence of rare, red listed or protected species, and a preponderance of alien species (particularly above the river banks). This is described further as follows.

5.1 Aquatic and hygrophytic vegetation

Large numbers of the alien floating aquatics *Pistia stratiotes* and *Eichhornia crassipes* (Water Hyacinth) occur above the weir, with smaller percolation below. There is a narrow band of reeds (mainly *Phragmites australis* with a smaller amount of *P. mauritianus* in a narrow band along the river banks and in an island within the river course, together dense growth of rafting grasses (mainly *Echinochloa pyramidalis*). A single example of the sedge *Cyperus dives*, occurs up-flow of the existing weir, this being a species that tends to persist on disturbed sites, and particularly amongst sugar cane cultivation. A small number of *Ludwigia octovalvis* herbs were also seen. All of the indigenous grasses, reeds, sedges or herbs mentioned are common species, and together they comprise only limited plant species diversity.

5.2 Terrestrial vegetation

Woody vegetation and scrub Interpolates with hygrophytic vegetation and is entirely dominant above the river banks. This vegetation is mainly comprised of alien species, particularly *Schinus terebinthifolius* (Pepper Tree) and Melia azedarach (Syringa), with *Chromolaena odorata* and escape of sugar cane beyond the bounds of cultivation. The full diversity of alien plants is provided in Appendix 2. A small number of common, pioneer indigenous trees are scattered in this growth, mainly comprised of *Bridelia micrantha* (Mitzeerie) and *Trema orientalis* (Pigeonwood). At least 10 *Raphia australis* (Kosi Palms) have been planted 60 to 70 metres south of the river bank flanking the sugar cane cultivation, together with a small number of *Erythrina lysistemon* (Common Coral Trees). None of the indigenous trees is rare or conservation important, except for Raphia australis which is red listed as Vulnerable (Raimondo et al 2009). This species does not occur naturally as far south as Richards Bay, and if a minority are subjected to disturbance or destruction, it is suggested that more be planted.

5.3 Sugar cane cultivation

All of this secondary and alien vegetation occurs within the surround of extensive sugar cane cultivation, some of which has escaped to the river banks.

6. Protected species

No species that are Protected, Specially Protected or Red Listed (Raimondo *et al.* 2009) were seen, except for the planted *Raphia australis* palms (which while red listed are not protected).

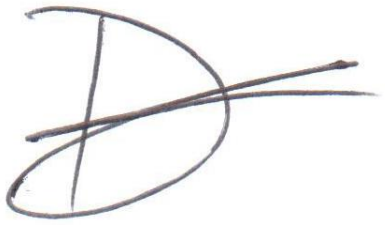
7. Conclusion

The vegetation at the site of the proposed activity is typical of highly disturbed areas. Terrestrial vegetation is mainly comprised of alien species, with indigenous species are limited to a small number of common, pioneer plants. The hygrophytic vegetation is also interpolated with alien plant invasion, with the indigenous component comprised of a small number common and mainly more robust indigenous species that are able to tolerate and persist in the face of disturbance.

As a result, the proposed development will not impact upon conservation important vegetation. No particular mitigations are suggested in respect of vegetation, except that if any of the planted *Raphia australis* palms are disturbed or destroyed, they should be replaced and then maintained until established.

Should you have any queries please do not hesitate to contact me through details below.

Yours sincerely



David Styles

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APPENDIX 1: Study site and detailed weir plan

APPENDIX 2: Species list

(Species marked with an asterisk * are alien)

Name	Common Name	* = Alien species
Acacia mearnsii	Black Wattle	*
Ageratum conzyoides	Blue Weed	*
Ageratum houstonianum	Blue Weed	*
Ambrosia artemissiifolia	Ragweed	*
Anredera cordifolia	Anredera	*
Bridelia micrantha	Mitzeerie	
Canna indica	Canna / Indian Shot	*
Cardiospermum grandiflorum	Balloon Vine	*
Catharanthus equisitifolia	Periwinkle	*
Centella asiatica	-	
Cestrum laevigatum	Inkberry	*
Chromolaena odorata	Chromolaena	*
Conzya spp.	-	*
Cyperus dives	-	
Datura spp.	Thorn Apples	*
Echinochloa pyramidalis	Antelope Grass	
Eichhornia crassipes	Water Hyacinth	*
Erythrina lysistemon	Common Coral Tree	
Ipomoea purpurea	Morning Glory	*
Lantana camara	Lantana	*
Litsea sebifera	Indian Laurel	*
Melia azedarach	Syringa	*
Mimosa pigra	Sensitive Weed	*
Oenonthera spp.	Evening Primroses	*
Passiflora spp.	Granadillas	*
Pennisetum purpureum	Napier Fodder	*
Pereskia aculeata	Barbados Gooseberry	*
Persicaria hydropiper	-	*
Phragmites australis	Common Reed	
Phragmites mauritianus	Lowveld Reed	
Pistea stratiotes	Water Lettce	*
Psidium guajava	Guava	*
Raphia australis	Kosi Palm	
Ricinus communis	Castor Oil Bush	*
Rivina humilis	Rivina	*
Rorippa nasturtium-aquaticum	Watercress	*
Rubus sp.	Bramble	*
Saccharum officinarum	Sugar Cane	*
Schinus terebinthifolius	Brazilian Pepper	*
Senecio madagascariensis	-	*
Senna didymobotrya	Peanut Cassia	*
Senna pendula	-	*
Sesbania punicea	Brazilian Glory Pea	*
Solanum mauritianum	Bugweed	*
Syzygium cordatum	Umdoni	
Tagetes minuta	Khaki Weed	*

Tecoma stans	Yellow Bells	*
Thevetia peruviana	Yellow Oleander Weed	*
Tradescantia fluminensis	-	*
Trema orientalis	Pigeonwood	
Trichilia emetica	Natal Mahogany	
Wedelia trilobata (= Spagneticola trilobata)	Singapore Daisy	*

APPENDIX 3: Existing weir site

View across the existing weir, with *Raphia australis* (Kosi Bay) planted next to dirt road 60 to 70 metres above the river's south bank.

View above the existing weir, on the rivers north bank, showing extensive floating alien *Pistea stratiotes* (Water Lettuce) with a smaller amount of *Eichhornia crassipes* (Water Hyacinth).

The existing weir.

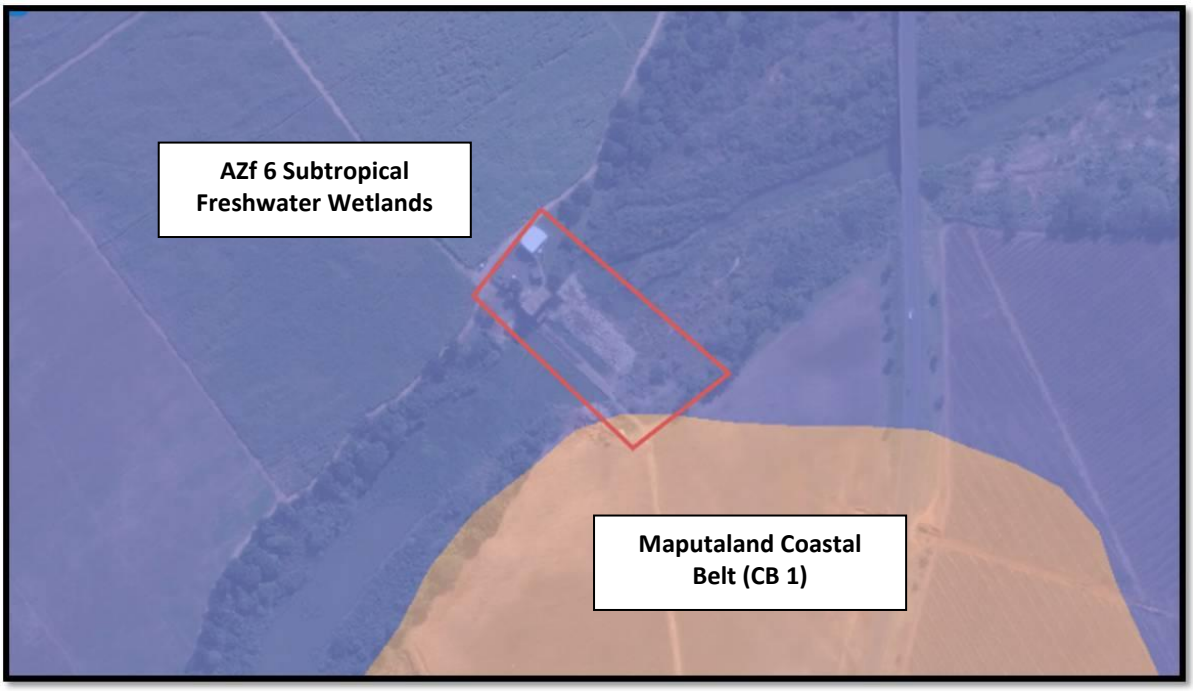
View across stand of the rafting grass *Echinochloa pyramidalis*, across the spillway. This grass will probably reestablish at the head of the new weir, if water is shallow enough next to the banks.

View of vegetation beneath the existing weir and spillway, comprising patchy and inconsistent bands of *Phragmites australis* (Common Reed) and a smaller amount of *P. mauritianus*), with a large amount of mainly alien woody and scrubby vegetation crowding the banks and edging into the river course.

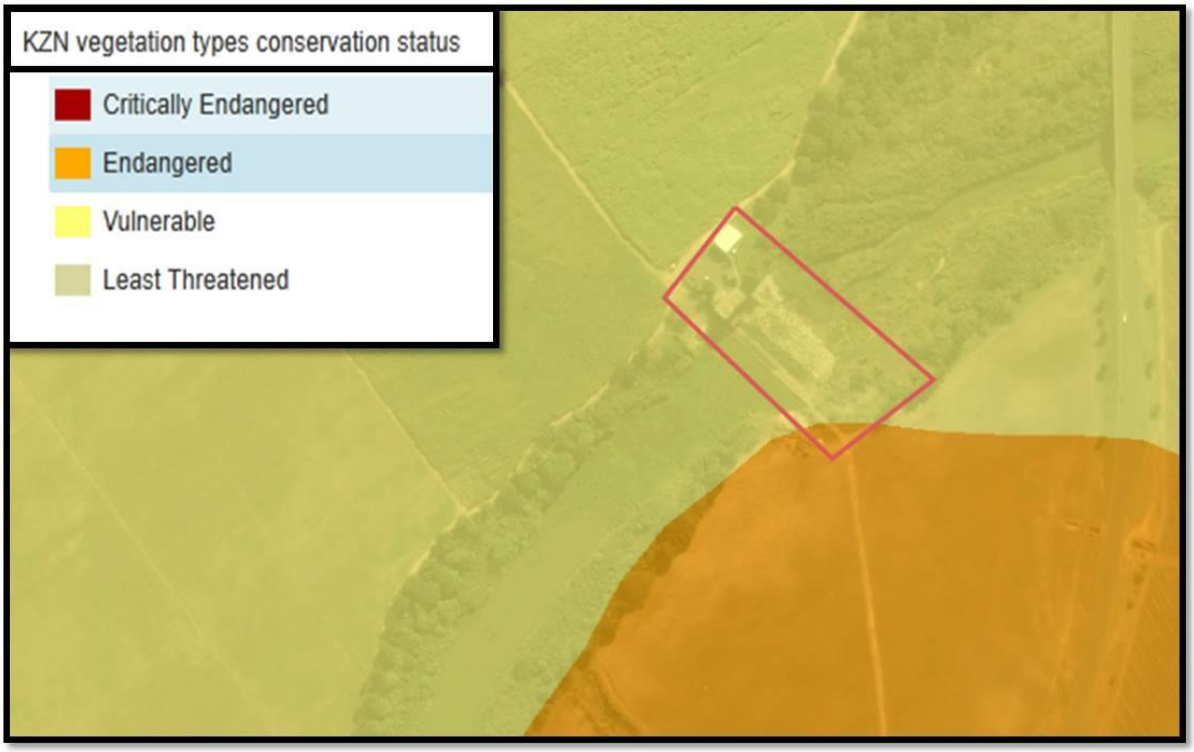
View of typical vegetation on the south bank, with a narrow band of *Phragmites australis*, crowded by alien trees (mainly *Schinus terebinthifolius* and *Melia azedarach*).

APPENDIX 4: Vegetation mapping

4.1: National and provincial vegetation mapping

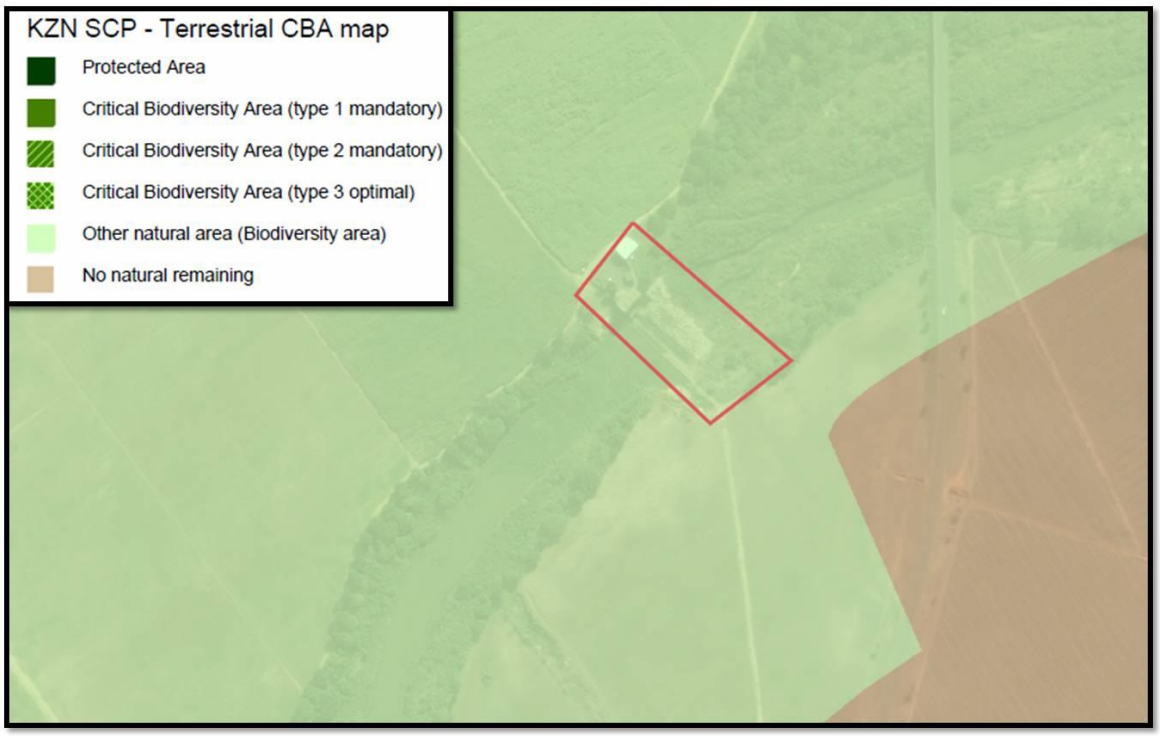


4.2: Vegetation conservation status (provincial corresponds with national)



Appendix 5: Ezemvelo KwaZulu-Natal Wildlife's Systematic Conservation Plans

5.1: Terrestrial C-Plan



5.2: Freshwater C-Plan